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HISTORY AND ANATOMY OF CESAREAN SECTION

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Abstract

Cesarean section is the delivery process that allows the babies who cannot be born vaginally by opening the abdominal wall and uterus. During the incision in the abdomen to reach the uterus, many layers are intervened. Cesarean section is widely used today. The first record of cesarean section in history goes back to 2000 BC. Numerous techniques have been used for Cesarean section surgery, with the discovery of human anatomy and the development of surgical and anesthesia techniques, it has reached today's standards. Because the site is anatomically complicated, it is important for clinicians to know the history of the surgery and the anatomical structure of the region. Our aim is to examine the history and anatomical development of this widely used cesarean section.

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Keywords:

Cesarean, Anatomy, History of medicine, Nursing, Birth

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Introduction

Cesarean delivery is the surgical removal of the fetus through the uterus when the mother and fetus are at risk for morbidity and mortality (Gungor & Oskay, 2015). While caesarean section was initially used to save the life of the expectant mother, it was performed as a low-risk operation that would later save the baby's life. However, today, apart from medical necessity, it is applied as a surgical procedure that edi the mother wants and facilitates the work of the physician (Demirgoz & Dereli, 2017).

The “ideal cesarean section (C / S) ratio, which has been targeted by the World Health Organization (WHO) since 1985, is between 10-15% (WHO, 2015). The countries with the highest cesarean section rates are; China, Brazil, Turkey, Mexico and Italy, while the ratio in the Netherlands, Belgium, Norway, is very low in developed countries such as Finland (Sayın et al., 2018).

The frequency of cesarean births in recent years, according to Turkey Demographic Health Survey data has increased significantly. The caesarean section rate, which was approximately 7% in 1993, almost doubled after 5 years. In the 1998 data, the cesarean delivery rate was reported as 13.9%, 21.2% in 2003, 36.7% in 2008 and 48.0% in 2013 (TNSA, 2013). Republic of Turkey Ministry of Health data for 2015 are 99% of births took place in health facilities, the C / S births 53.1%, primary C / S of the share of all births were reported while as 27.2%. It was stated that 37.5% of C / S deliveries were performed in Ministry of Health, 69.3% in university hospitals and 70.5% in private hospitals (Ministry of Health, 2015).

Cesarean delivery is preferred because of fetal distress, presentation anomalies, multiple pregnancies, fetal anomalies, previous uterine surgery, systemic diseases, vertical maternal infections, indications for labor or delivery. The desire of the mother should not be a reason alone for caesarean section and should be considered when there is a psychological condition such as excessive fear, anxiety and panic of the person (Gungor & Oskay, 2015).

Among the reasons for the rapid increase in the rate of cesarean delivery, technical advances in terms of operation technique and anesthesia, mortality and morbidity in the mother and the baby are believed to be less, physicians can determine the timing of the delivery and the duration of the delivery, pregnant women preferred to use cesarean delivery. In order to avoid malpractice cases in case of intervened labor, increasing risky pregnancies and advanced age pregnancies can be considered (Bal et al., 2013).

In a study conducted by Oner and Kocas (2016) with 523 women who had delivered at least once in a community health center, 27% were voluntarily, 13.5% due to presentation anomaly and 11.7% due to presentation anomaly. because of previous C / S, 9.1% due to non-progressive labor, 7.3% due to fetal distress, 4.4% due to placental anomalies, 2.9% due to multiple pregnancy reported that they are with (Oner & Kocas, 2016). In a study conducted by Cakmak et al. (2014) in a university hospital with 500 women, the reasons for preference were asked to women who stated that they would prefer optional cesarean delivery; 42.2% stated that they were afraid of vaginal delivery, 31.6% stated that the cesarean section was painless, 15.8% stated that the mother and the baby suffered less harm in the cesarean section and 10.5% thought that vaginal delivery was more risky (Cakmak et al. 2014). Zhang et al. (2010)

reported a cesarean delivery rate of 30.5% in a study conducted with 228,668 women in 19 hospitals in the USA. The most frequent indication for cesarean deliveries was due to dystocia with 47.1% (Zhang et al., 2010).

Our aim is to examine the history and anatomical development of this widely used cesarean section.

Cesarean section from past to present

It is known that cesarean operation is as old as human history. According to the law of "Lex Regia" in ancient Rome; it was forbidden to bury the baby of the dead pregnant woman without being removed from the uterus, and this law was later called "Lex Ceaserea". Records of the birth of a live baby were found in Sicily in 508 BC when this law was applied (Komurcu & Gencalp, 2002).

Caesarean section has been a part of human culture since ancient times, and information about caesarean section dates back to ancient Hindu, Egyptian, Roman and Greek folklore. According to Greek mythology, Apollo removed Asclepius, the founder of the famous religious medicine, from his mother's womb (Figure 1) (Sewell, 1993). There is also controversial information that the name Caesarean section was used because Julius Caesar was born with this method. The Romans called caesarean section “a caeso matrix utero”, which means until the last century BC “to cut the belly of the dead mother”. Historian Pliny the Elder (A.D. 23–79) called this action “caesones” to indicate the importance of non-vaginal delivery (Turamanlar & Songur, 2014).

Figure 1. Asclepius' Father Apollo removed from his mother's uterus

Caesarean section was only used to save the unborn baby when the mother died or was thought to die. Cesarean section was performed as a last resort and it was not considered to protect the mother's life during the operation (Sewell 1993). Although the Middle Ages was largely seen as a recession period in science and medicine, caesarean section was seen as an effort to save the lives of women during this period (Komurcu & Gencalp, 2002). The first written record of the mother and the baby after the caesarean section was the operation of Jacob Nufer's wife in 1500 in Switzerland. Nufer's wife could not have been born despite the help of thirteen midwives. Her desperate husband received permission from the local authorities for cesarean section and rescued the mother and baby alive after cesarean section. (Komurcu & Gencalp, 2002; Turamanlar & Songur, 2014).

Leonardo da Vinci, who lived in the 16th century, has drawings of the situation of the pregnant woman and the child in the uterus, which have greatly contributed to the development of caesarean section (Figure 2) (Turamanlar & Songur 2014). Andreas Vesalius, known as the founder of modern anatomy, published Corpor De Corporis Humani Fabrica 15 in 1543, which can be considered a turning point in this subject and shows the anatomy and abdominal structures of women (Figure 3). This work provided a theoretical basis for surgeons for cesarean delivery in the 17th and 19th centuries (Sewell, 1993).

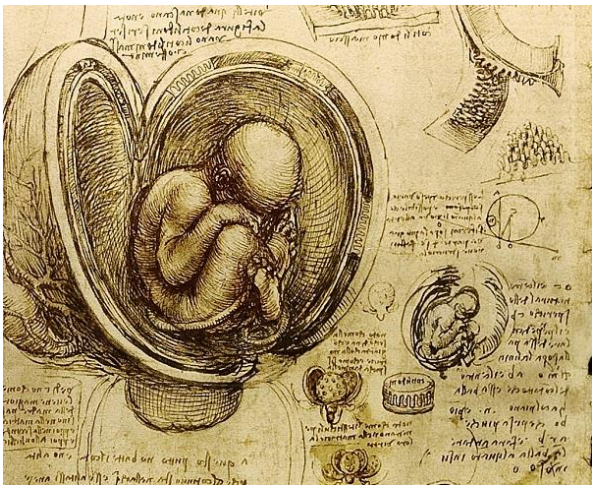

Figure 2. Drawings of Leonardo Da Vinci on the Situation of the Pregnant Woman and the Child in Uterus

Figure 3. Anatomy of the Female Pelvis from Andreas Vesalius (De Corporis Humani Fabrica)

A British traveler named R .W Felkin (1879) witnessed a cesarean operation in Uganda. In this operation, banana wine was used as a disinfectant by analgesic and wiping the abdomen. They used a paste from the plant roots on the wound and applied a bandage with a tight cloth after surgery. Felkin observed the patient after caesarean section and stated that it became operational in the field after 11 days (Komurcu & Gencalp, 2002; Lurie & Glezerman, 2003).

In the 18th and 19th centuries, knowledge of anatomy increased significantly. However, the first successful cesarean section operations that have proven the survival of the mother and the baby have started to be described. Throughout history, as the subtleties of human anatomy are explored, as in all surgical techniques, the technique of caesarean section surgeries has developed and has reached to today's standards with the developments in anesthesia (Turamanlar & Songur, 2014).

Anatomy of cesarean section

Abdomen is the part of the body between the thorax and the pelvis. Cavitas abdominis closes the space called front and side (Ozan, 2004). Abdomen is home to important organs of the digestive and excretory system. Some abdominal organs may extend beyond the abdominal boundaries and extend into the pelvic cavity as well as enlarged pelvis organs extending upwards into the abdomen (Gilroy, 2015).

Nowadays, the most commonly performed abdominal surgery is caesarean section (Taffel et al., 1991). During the incision, the uterus is reached using different techniques. During this incision, we will try to explain which layers are treated from superficial to deep (Figure 4).

1. Skin: The largest organ of the body, the skin is the most superficial layer in this region (Ozan, 2004).
2. Fascia superficialis: It is a layer of loose connective tissue located just under the skin. It has two layers on the front and side walls of the abdomen (Camper's fascia and scarpa's fascia) (Moore & Agur, 2015).
3. Fascia profunda: It is a very thin layer and wraps m.obliquus externus abdominis (Moore & Agur, 2015).
4. The fascia of m.obliquus externus abdominis
5. Aponeurosis of m.obliquus externus abdominis
6. Ligamentum inguinale: Aponeurosis of M.obliquus externus abdominis occurs when the spina iliaca thickens between the anterior superior and the tuberculum pubicum (Gokmen, 2008).
7. Ligamentum lacunare: Lig. inguinale'in the inner end of the fibers separated from the back and out of the pecten ossis is the bond formed by the pubis'e (Gokmen, 2008).
8. Annulus inguinalis superficialis: It is the slit-shaped opening formed by the fibers of m.obliquus externus abdominis on the upper-outer side of the tuberculum pubicum (Moore & Agur, 2015).
9. The fascia of M.obliquus internus abdominis
10. Fibers of M.obliquus internus abdominis
11. Tendo conjunctivus: M. obliquus internus abdominis and m.transversus abdominis aponeuroses combine to form this structure and attach to the pubis (Gilroy, 2015).
12. Ligament of Hen: The outward extension of the lateral edge of M.rectus abdominis, m. together with aponeurosis of the transversus abdominis and fascia transversalis, it forms this ligament (Ozan, 2004).
13. Fascia transversalis: It is a deep fascia covering the posterior face of M. transversus abdominis (Ozan, 2004).
14. Extraperitoneal tissue
15. Peritoneum parietale

16. Cavitas peritoenalis
17. Peritoneum viscerale
18. Uterus

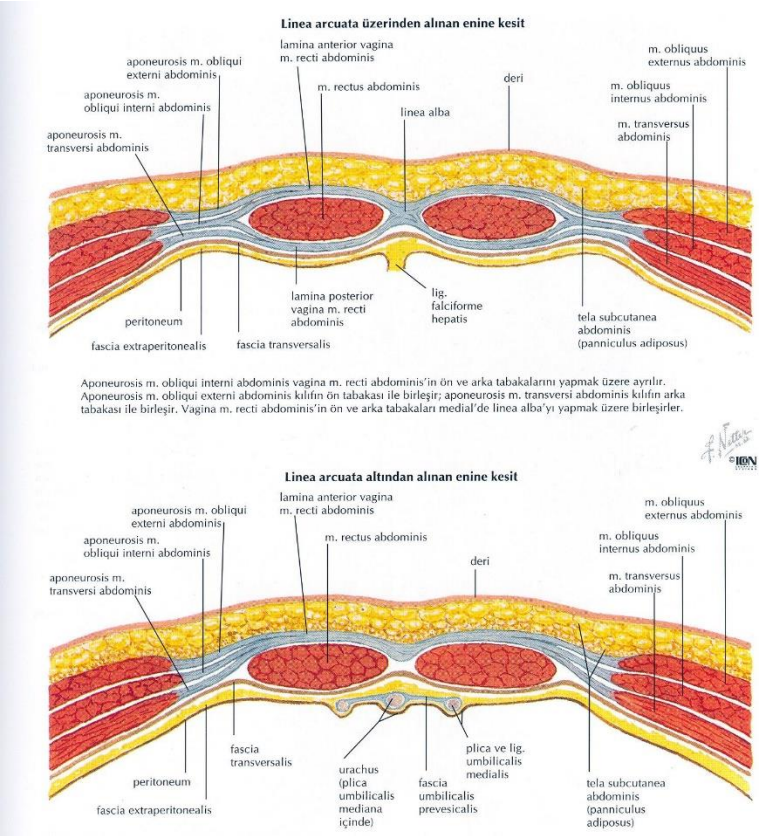

Figure 4. Front and Side of Abdomen

We think that knowing the anatomical structure of this region will facilitate the work of health professionals who are interested in the region and also reduce possible complications.

Complications of cesarean section

Caesarean delivery, which was performed only in mandatory cases in the early times, became applicable by the mother's own will over time and began to be applied as an alternative to normal birth. The American Gynecologists Association stated that caesarean section is a surgical procedure, it should be done due to medical reasons and vaginal delivery is definitely not an alternative (ACOG, 2003). For this reason, cesarean delivery is a surgical procedure and when planning a cesarean section, the benefits and risks specific to pregnancy, pregnancy and baby should be considered (ACOG, 2003).

It is stated that the risk of maternal morbidity and mortality is 4-7 times higher than that of normal births. When we look at the problems; bleeding, infection, neighboring organ injuries, thromboembolic conditions and anesthesia-related complications are the most frequently mentioned problems (Sahin, 2009). When we look at the maternal complications of cesarean delivery due to the mother's desire; risks such as increased risk of bleeding (hemorrhage), longer hospitalization, maternal recovery, increased risk of infection, placental problems in subsequent pregnancies, prolonged postpartum pain, impaired mother and infant communication, and decreased breastfeeding, urinary incontinence ratio can be seen (Bal et

al., 2013). The American Society of Obstetrics and Gynecology (ACOG) stated that the duration of hospital stay of the mother increased after optional cesarean delivery, uterine rupture, placental anomalies and obstetric complications increased in subsequent pregnancies (ACOG, 2013).

The American Society of Obstetrics and Gynecology (ACOG) stated that in terms of neonatal outcomes, problems such as hypothermia, hypoglycemia, respiratory distress syndrome, respiratory failure and hospitalization in neonatal intensive care unit increase in infants born with optional cesarean section (ACOG, 2013).

Result

According to WHO data, caesarean section rates have increased over time in almost all countries of the world and have exceeded the recommended rate of 10-15% by WHO. This increase in our country in recent years is quite remarkable.

Studies on cesarean section emphasize that this type of operative delivery should be preferred in the presence of a condition that threatens the health of both mother and baby and draws attention to the increasing rate of cesarean delivery throughout the world. Risks in cesarean delivery are higher than vaginal delivery. In the light of all this information, the necessity of encouraging normal birth by decreasing cesarean delivery rates is an undeniable necessity both in terms of maternal and fetal mortality and morbidity and in terms of material burden for our country.

Compilation studies about cesarean section are rare in the literature. In this study, which we talked about the historical development and anatomy of cesarean section, we think that it will be useful for clinicians working in the field of Obstetrics and Gynecology.

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IS THERE A RELATION BETWEEN FIVE FACTOR PERSONALITY FEATURES AND ADVERTISING ALLOWED IN HEALTH?

Okan Anıl Aydın[1]

Abstract

The health sector is the sector in which the health level of the society is increased, the country's greatest added value is the physical and mental well-being of the people, and many more good development or improvement of bad health conditions are applied. With the increasing competition conditions in the health sector in recent years, more attention has been paid to advertising. In this case, this study has been conducted in order to provide preliminary information about the advertising activities that are available in our country and the possible changes to be made in the future.

The aim of the study is to find out whether there is a relationship between five factors personality traits and freedom of advertising in health. The sample of the study is 400 students studying at Sakarya University. Students was made a questionnaire consisting of three parts. The questionnaire included demographic characteristics, five-factor personality features, and freedom of advertising in health. The resulting questionnaire with SPSS 24 software, Frequency Analysis, Pearson Correlation Coefficient, One-Way Analysis Of Variance and T-Tests were performed.

According to the results of the analysis, a significant relationship was found between the five factors personality features and the freedom of advertising in health. According to demographic characteristics, there was a significant difference between the results freedom of advertising in health according to some variables.

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Keywords:

Health, Advertising, Personality, Five Factors, Freedom

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Introduction

People have been arguing over the concept of personality for centuries, but no definite theory has been put forward about the formation of personality. There are many definitions of personality because it is a comprehensive concept and it has many features related to human attitudes and behaviors (Merdan, 2013). It can be said that the general reason for this is due to the differences in the reflections of an individual's innate characteristics and later characteristics (Merdan, 2013). However, personality, the individual's approaches, behaviors, characteristics, abilities, speech style, physical appearance and the harmony against external influences (Yıldız and Dilmac, 2012). In other words, it can be defined as a different and structured relationship form established by the individual with his inner and outer environment (Ozguner, 2015).

Based on these definitions of personality, it can be said that personality can differ from person to person. It is thought that people with different personalities will not have the same view of life and behaviors and therefore personality traits will be original and unique (Tokat et al., 2013). In such a case, it is assumed that the answers to the question whether advertising should be free in health, which is one of the important issues for health, will also vary from person to person.

One of the commonly used scales to measure personality traits of people is the five-factor personality scale. The five-factor personality scale consists of five dimensions (neuroticism (emotional balance), extraversion, responsibility, openness to experience, and agreeableness). It is an evaluation model that defines this personality in the most comprehensive way (Goldberg, 1990; McCrae and Costa, 2008). Five dimensions that make up the model;

Neuroticism is defined as a tendency to react socially and psychologically. The high level of neuroticism includes repulsive emotions such as tension, hate, boredom, insecurity, anxiety and frustration, while low levels of neuroticism are associated with calmness and compliance (McCrae and Costa, 1987).

Extraversion is defined individuals who are full of life, cheerful, excited, sociable, talkative and social (Somer Korkmaz and Tatar, 2011) and adventurous, assertive, energetic and brave. The low level of this feature can be explained by the uncommunicative personality traits (Fleeson et al., 2002).

Responsibility refers to the individual's control, discipline perception and control-oriented behaviors. The opposite can be defined by the weakness of self-control and lack of discipline (Arthur and Grazziano, 1996).

Openness to experience is defined that a person is sensitive to imagination, art and beauty, is behaviorally flexible and intellectually curious, experiences complex emotions and possesses liberal values. On the other hand, in low scales, it means distance to life and closed to innovation (McCrae and Sutin, 2009).

Agreeableness defines that an individual is lovable, pleasant and harmonious in his relationships with others. People who score high scores are described as self-sacrificing, and otherwise selfish (Graziano and Tobin 2009).

Advertising in health care is one of the issues that has been discussed for decades. While it is seen as an unnecessary cost element by some groups, in others, people are required to be free because they need to be provided with better service and information (Karafakioglu, 1998).

Advertising is an announcement and promotion in which certain advertisers pay for the purchase, sale or rental of certain products or services (Ersoy et al. 2008). There are two most used advertising types in the health sector. One of them is corporate advertising. It aims to regulate patients' relations with the institution and increase their knowledge. The other is covered advertising. Competition among health institutions stands out in this type of advertisement. In this type, the words “the best” and "the best quality ”are used (Guler, 2006; Tengilimoglu, 2000).

When we look at advertising in health in depth, some circles see advertising efforts as waste of resources in this area, especially since advertising is not a factor affecting demand in health services (Temel and Akıncı, 2016). In addition, the fact that the technology used in the health sector in recent years has reached very advanced levels and the introduction of technology to service users is considered important in terms of access to service. In other words, healthcare providers want the public to be aware of the high investments they make and that more patients come (Tengilimoglu, 2000). In the light of this information,

the relationship between freedom of advertising in health and five-factor personality traits will be investigated.

Purpose

The aim of the study is to determine whether there is a relationship between personality characteristics of health consumers and freedom of advertising in health.

Method

The questionnaire method was used to collect data in the research. The questionnaire consists of three parts. In the first part, demographic characteristics of the participants are given. The second part of the questionnaire consists of five factors personality trait scale developed by Rammstedt and John (2007) and adapted to Turkish by Horzum et al (2017). The scale consists of 5 factors and 10 questions. Five-Point Likert system was used in the scale. The scale is 5:" Always", 4:" often", 3:" sometimes", 2:" rarely", 1:" never". The third part was composed of 20 questions and 5 factors, which were developed by Ekiyor and Tengilimoglu (2014) to measure the freedom of advertising in health. Five-Point Likert system was used on the scale. The scale is 5: "strongly agree", 4: "agree", 3: "undecided", 2: "disagree", 1: "strongly disagree". The validity of the scales was made by the developers.

The universe of research consists of university students studying at Sakarya University. In the sample of the study, easy sampling which is not based on probability was used. Between March and April 2019, 400 face-to-face students were questionnaired. Sample size is sufficient (Altunısık et al, 2017). The study is limited to Sakarya University.

Cronbach Alpha was used to analyze the reliability of the scales used in the study. The Cronbach's Alpha value of the five-factor personality trait scale was 0.716. The Cronbach's Alpha value of the freedom of advertising in health scale was found to be 0.744. For this scale, the 19th and 20th questions were not included in the reliability analysis because they included general statements.

SPSS 24 program was used for data analysis. Frequency analysis was performed for the frequency of demographic characteristics. In order to determine whether there is a significant difference between demographic variables and freedom of advertising in health, T Test and One Way Analysis of Variance (Anova) tests were applied. Pearson Correlation analysis was used for the relationship between five factors personality type and freedom of advertising in health.

The following hypotheses were tested in the study.

H1: There is a significant difference between demographic characteristics of participants and freedom of advertising in health.

H2: There is a significant relationship between the personality traits of participants and the idea of participation in the freedom of advertising in health.

Results

54.3% of the participants were male and 45.7% were female. 153 of the participants were 21-22 years old. When education times is taken into consideration, 51.5% have evening education. When the monthly income is considered, 34.8% of the participants have monthly income between 701-1400 TL, 34.3% is 700 TL and below and 31% is 1401 TL and above.

The first hypothesis of the study is the following findings regarding the relationship between the demographic characteristics of the participants and the advertising groups identified in the health sector.

Table: 1

Results of Freedom of Advertising in Health in Terms of Gender

DIMENSIONS	Gender	N	X	S	t	Sig. (p)
Introductory	Male	217	3,4217	.94382	.684	0,259
	Female	183	3,3489	.88003		
Informative	Male	217	4,0271	.76229	.116	0,454
	Female	183	4,0168	.76347		
Regulator	Male	217	3,8419	.79501	-2,077	**0,020**
	Female	183	4,0131	.58676		
Negative Effect	Male	217	2,9857	.87514	.358	0,360
	Female	183	2,9479	.95048		
Impressive	Male	217	3,0883	.99373	.-616	0,270
	Female	183	3,1622	1,07923		

In Table 1, Independent Samples T Test was applied to examine the effect of gender on freedom of advertising in health sector. According to the test results, there is a significant difference between regulatory advertisements (t = -2,077; p = 0,020). The average score of female students in terms of regulatory advertisements is higher than male students.

Table 2:

The Results of Freedom of Advertising in Health Sector in Terms of Education Times

DIMENSIONS	Education Times	N	X	S	t	Sig. (p)
Introductory	Daytime Education	194	3,3196	.11300	.093	0,467
	Evening Education	206	3,3301	.11311		
Informative	Daytime Education	194	3,8557	.11457	-1,345	0,133
	Evening Education	206	4,0097	.11495		
Regulator	Daytime Education	194	3,8093	.11084	.206	0,404
	Evening Education	206	3,7864	.11086		
Negative Effect	Daytime	194	2,7010	.10510	-3,260	**0,001**

	Education					
	Evening Education	206	3,0437	.10516		
Impressive	Daytime Education	194	3,1804	.12183	1,082	0,132
	Evening Education	206	3,0485	.12201		

In Table 2, since the teaching status variable consists of two categories, Independent Samples T Test, which is one of the parametric tests, was applied. According to the results of the test, there is a significant difference between negative effect advertisements (t = -3,260; p = 0,001). Evening Education students' average scores for negative effect advertisements is higher than the Daytime Education. Monthly income and age demographic variables were not statistically significant.

The second hypothesis of the study is the following findings for the relationship between the five-factor personality traits of the participants and the advertisement groups in the health sector.

Table: 3

Five Factor Personality Traits Freedom of Advertising in Health Sector

DIMENSIONS		**Extraversion**	**Agreeableness**	**Responsibility**	**Neuroticism**	**Openness to Experience**
Introductory	r	.075	.046	-.013	-.006	-.047
	Sig. (p)	.098	.426	.414	.459	.207
	N	400	400	400	400	400
Informative	r	.395*	.521**	.409*	-.053	-.093
	Sig. (p)	**.049**	**.000**	**.030**	.180	.053
	N	400	400	400	400	400
Regulator	r	.508*	.403**	.074	-.008	-.010
	Sig. (p)	**.031**	**.000**	.101	.450	.429
	N	400	400	400	400	400
Negative Effect	r	.012	.024	-.027	.516*	.061
	Sig. (p)	.420	.676	.317	**.022**	.145

	N	400	400	400	400	400
Impressive	r	.044	.050	-.018	-.061	.060
	Sig. (p)	.226	.390	.381	.152	.152
	N	400	400	400	400	400

According to the above results, there is a significant relationship between informative (r: .395; $p<0.05$) and regulatory (r: .508; $p<0.05$) advertising dimensions in the health sector and students with extraversion personality characteristics. There is a weak positive correlation with the informative advertisements and a moderately positive correlation with the regulatory advertisements.

According to the above results, there is a significant relationship between informative (r: .521; $p<0.05$) and regulatory (r: .403; $p<0.05$) advertising dimensions in the health sector and students with agreeableness personality. There is a weak positive correlation with informative advertisements and moderate positive regulatory advertisements.

According to the above results, there is a significant relationship between informative (r: .409; $p <0.05$) advertisement dimension in students with responsibility personality traits. There is a weak positive correlation between responsibility personality trait and informative advertising dimension.

According to the above results, there is a significant relationship between negative effect (r: .516; $p<0.05$) advertisement dimension in students with neuroticism personality traits. There is a moderate positive correlation between them. Finally, there was no significant relationship between any advertising dimension related to openness to experience personality trait, which is one of the other five factors personality traits.

Finally, in the frequency analysis for the 19th and 20th questions of the freedom of advertising in health scale, the participants stated that they were undecided.

Discussion and Conclusion

In this study, the relationship between five factors personality type and freedom of advertising in health was tried to be revealed. In addition, a significant difference between the demographic characteristics of the participants and the freedom of advertising in health was investigated. According to the results of the research, the expected results were reached at a certain level.

According to the findings of the study, a significant difference was found between the freedom of advertising in health according to gender and education times, while no differences were found between monthly income and age demographic variables. Similarly, in the study of Ekiyor and Tengilimoglu (2014), no significant difference was found between age variable and advertising dimensions. A significant difference was found between the gender variable and the regulatory advertising factor. This finding is similar to that of Ekiyor and Tengilimoglu (2014) because both studies found significant differences between the types of regulatory advertising. Female participants looked more positively than male participants because of their higher average. Men stated that they were undecided, while female participants preferred to agree. In addition, a significant difference was observed between the education times and with negative effect advertisement.

When we come to the point where the research emphasizes, it is seen that there is a significant relationship between the five factors personality types and the freedom of advertising in health. In particular, there is a moderate positive correlation between extraversion, agreeableness and responsibility personality types and informative advertising types. This means that if there is any increase in these three types of personality, there will be a moderate increase in the level of participation in informative

advertising. So informative advertisement are generally acceptable. Another important finding is the positive correlation between regulatory advertisement types and extraversion and agreeableness personality traits. This means that as these personality traits increase, regulatory advertisement will increase. Finally, there is a moderate positive correlation between negative effect advertisements and individuals with neuroticism personality traits. This will be seen as an unnecessary practice in health advertising as neuroticism personality traits increase. There are no significant differences in factors such as introductory and impressive advertising types and openness to experience. This shows that there is no significant difference between the participants' positive or negative thoughts about these factors.

According to the findings, in the light of the participants, we can talk about the relationship between health advertising and five factor personality scale. This is a situation that needs to be paid attention for future advertising practices in health. However, it is important that the undecided option is selected intensively when the data is examined. This may mean that participants do not have enough information about the subject. The research should be conducted in more depth in the following period and attention should be paid to ensure that the sample has sufficient information about the subject.

The subject freedom of advertising in health is a subject that the health sector needs to focus on in today's competitive conditions and that appropriate regulations should be made. Primarily, the public needs to be informed about this issue and to be allowed to advertise as needed. Because the positive opinions of the participants about informative advertising show that this issue should be considered. It can be foreseen that the progress of health enterprises by setting such a target will have positive results for both sides.

Another important consideration is that there is no significant relationship between introductory and impressive advertising dimensions and five factors personality traits. In such a case, the participants are indifferent to the introductory and impressive advertising of the health sector.

The result from the study; five factors personality traits are related to freedom of advertising in health according to some factors. Attention should be paid to these relations and the legislators of our country should allow the health sector to advertise at a certain level and freedom. In doing so, preventing the public from bad advertisements will increase the effectiveness of correct information and regulations.

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TECHNOLOGICAL REHABILITATION PHILOSOPHY

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Abstract

Technological rehabilitation includes robotic and wearable devices, virtual reality applications, three-dimensional motion analysis systems and e-health and mobile health applications. Our aim was to determine the framework of the philosophy and aims of rehabilitation technology.

These systems have been developed to achieve objective and reliable results, to shape treatment sessions and to improve quality, reduce labor and cost. As the demand for therapy is expected to increase in the future, the technology that will enable patients to receive training with minimal therapist time consumption has an important role. E-health and mobile health systems can be utilized effectively in data generation, storage, transportation, analysis, sharing and security. Robotic devices, on the other hand, are the equipments that come to the forefront in rehabilitation applications with the development of technology. These devices help to make objective, reliable analysis by recording kinetic and kinematic data. Another example of technological rehabilitation is virtual reality (VR) applications. In these systems, by making use of virtual games and visual and audio feedback, it is aimed to get the task and many repetitions as motivated. Finally, optical systems are commonly used in motion analysis and are accepted as the gold standard. They require experienced personnel skills and sufficient laboratory space.

In the studies, it has been concluded that it has made significant contributions in terms of speed, efficiency, accessibility and cost. With such technologies, patients can exercise more often, resulting in better results and faster progress in motor (re) learning.

Although positive results are obtained in the current studies, the development of these systems continues and it is aimed to increase the further studies.

Keywords:

Technology, Innovation, Robotics, Virtual Reality, Rehabilitation, Rehabilitation Philosophy

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Rehabilitation technology is a personalized service that can help individuals overcome the barriers to full participation in education, rehabilitation, employment, transportation, independent living and recreation. This technology includes devices or services that are necessary for individuals to overcome functional limitations (NYSED, 2019). Among these technologies; robotic and wearable devices, virtual reality applications, three-dimensional motion analysis systems and e-health and mobile health applications. Because of the increase in the health care costs of population increase, thoughts such as reducing the frequency of visits to the hospital, benefiting from the experts in a more beneficial way and creating more effective treatment areas with access to statistical information about the disease have enabled the establishment and spread of telemedicine applications (Isik, A. H., & Guler, I., 2010). As the demand for therapy is expected to increase in the future, the technology that will enable patients to receive training with minimal therapist time consumption has an important role (Krebs et al., 2003; Johnson et al., 2005). With such technologies, patients can exercise more often, resulting in better results and faster progress in motor (re) learning (Merians et al., 2002).

The European Commission's Health Commission defined the concept of e-health; "The use of information and communication technologies (network connections, mobile software, robotic applications, smart devices, databases, video conferencing, etc.) in health services and prevention, diagnosis and treatment of diseases, monitoring and management of health (European Commission, 2019).

Mobile technology can be defined as a technology that allows users to access, exchange or communicate data in public and private networks such as the Internet without the use of cables or similar devices without any time and space limitations (Hanayli et al., 2015). Mobile health is defined as supporting health services and applications through mobile technology devices (Guler, E., & Eby, G., 2015). The use of these devices by patients and healthcare personnel is becoming more widespread and enables them to benefit from patient / disease monitoring systems by working in integration with central servers.

These systems are used effectively in the production, storage, transportation, analysis, sharing and security of data (Kilic, T., 2017). MyGlycemia, Glooko and Fizyoprint are examples of mobile applications; e-nabiz and MHRS are web-based applications.

Robotic devices, on the other hand, are the equipments that come to the forefront in rehabilitation applications with the development of technology. These robots are devices for the activation of a limb for sensoriomotor rehabilitation, but also interactive motor devices for potentially cognitive rehabilitation. These systems; It is based on the principle of providing more repeatability with a task-oriented approach and less workload. Some studies show that robotic technology can be used to improve quality and assessment in neurological rehabilitation, increase productivity and reduce costs in this area (Garcia et al., 2011). These devices help to make objective, reliable analysis by recording kinetic and kinematic data (Bertomeu-Motos et al., 2015).

Most of the technological devices applied to rehabilitation are based on advances in neuroscience, which allows us to better understand the phenomenon of brain plasticity underlying the efficacy of rehabilitation (Mehrholz, J., & Pohl, M., 2012).

Regardless of whether they are related to the upper or lower extremities; rehabilitation robots are divided into two groups. Automatic exoskeleton that moves legs by controlling the displacement of each segment, and end-effector devices that allow the mobilization of a limb from a distant application point and control of various joints (Mehrholz, J., & Pohl, M., 2012; Bruni et al., 2018). The definition of an end-effector principle can be defined as simulating the posture and swing phases of the patient's feet on the platform during gait trainings; exoskeleton devices are external robots that can move knees and hips with programmable drives or passive elements. Examples of exoskeleton devices are ‘‘LOPES” (Lower-extremity Powered ExoSkeleton) and ‘‘Lokomat”. Examples of end-effector devices are ‘‘G-EOsystem”, ‘‘Lokohelp”, ‘‘Haptik Walker” and ‘‘Gait Trainer GT1’’.

Most robots interact with a virtual environment. The technological complexity of these different systems is quite uneven as it reflects the immature nature of these technologies (Krebs, H. I., & Hogan, N., 2012). The importance of lower limb rehabilitation in hemiplegic patients has been confirmed, and its effectiveness in upper limb rehabilitation is still debated (Hammami et al., 2012).

There are also studies showing that robot-assisted rehabilitation therapy is more effective in upper extremity motor gain than traditional therapy when placed in a complete rehabilitation program (Mehrholz et al., 2012).

In some studies, the "dose" effect is greater than for robot-assisted gait rehabilitation than for robot-assisted upper extremity rehabilitation. Paradoxically, these devices generally offer less advanced functions than those used for upper extremity. The interaction with the patient is often based on the parameters defined by the therapists and the application of force to perform the individual's "normal" gait pattern. There are few devices with self-adaptive functions where the machine can adapt to patient performance (Forrester et al., 2013).

The immature nature of the technology is largely limited by the price of the devices and the reluctance of therapists and patients to use them (Reinkensmeyer, D. J., & Boninger, M. L., 2012). These reluctance feeds on the fear of rehabilitation robots replacing human assistance; however, most studies have shown that the effectiveness of robot-assisted rehabilitation is based on integration into a global program of rehabilitation therapists (Laffont et al., 2014). Considering the limitations of the studies, it is observed that there is a need for comprehensive studies with more cases and a common procedure.

Another example of technological rehabilitation is virtual reality applications. Virtual reality includes different technologies such as sensors, telecommunication technologies, human computer interfaces, and private server or cloud services. These technologies can support precise and detailed capture and analysis of complex kinetic and kinematic variables during motor rehabilitation (i.e., distribution of the center of pressure during standing or walking, time and speed of limb movements) (Lourenco et al., 2018).

Virtual Reality (VR), “a high-end user computer interface that includes real-time simulation and interactions over multiple sensory channels” , should evoke a sense of 'presence' and 'control over' the

simulated environment (Kim et al., 2017; Witmer, B. G., & Singer, M. J., 1998). The sense of "presence" consists of the sense of presence in an environment, even if it is not physically present in that environment; the sense of 'overcoming control' includes the possibility of interacting with objects that in this case give a sense of presence in the environment or environment (Corbetta et al., 2015).

The main feature VR provides is the ability to always repeat the same task, changing factors such as the level of complexity, the time and intensity of the application (Lledó et al., 2016). In these systems, by making use of virtual games and visual and audio feedback, it is aimed to have the person perform the task and many repetitions in a motivating way as mentioned.

VR can be used to promote motor learning and rehabilitation as it can be adjusted to produce the environment, scenario or activity that allows motor skills to develop neural plasticity due to motor experience (Doyon, J., & Benali, H., 2015).

Virtual reality systems can be illustrated as follows: Nintendo Wii, Xbox 360 Kinect, CAREN (Computer Assisted Rehabilitation Environment System), IREX (Interactive Rehabilitation and Exercise System) and VR (RE-ACTION) (Ravi et al., 2017).

Finally, optical systems are systems that are often used in motion analysis and are considered the gold standard. The disadvantage of these is that they require experienced personnel skills and sufficient laboratory area. As an alternative to these systems, sensors such as gyroscopes, axelerometers can be used. Thus, it provides advantages both in terms of preventing the place problem and in terms of ease of use (Petraglia et al., 2018).

The rapid development of technology has significantly affected health care as well as in all areas. This development, which manifests itself in many areas from robotic devices to virtual reality systems, is used for many purposes, such as motivating, encouraging, supporting the patient in the process of treating individuals, and performing numerous frequent repetitions. In addition, these systems have emerged to assist clinicians in the work force. There are studies that demonstrate the effectiveness of these systems, but also studies in opposing view. It is thought that studies in specific protocols and in more cases may yield more meaningful results.

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INVESTIGATION OF THE EFFECTS OF MANUEL TREATMENT IN PHYSIOTHERAPY- REHABILITATION OF PATIENTS WITH CHRONIC LOW BACK PAIN

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Abstract

Aim: The aim of this study was to investigate the effects of manual threatment in physiotherapy and rehabilitation of patients with chronic low back pain.

Material and methods: 30 patients, aged between 18-65, who accepted to be included in this study and diagnosed as chronic low back pain, were randomly divided into 2 groups: 1 control and 1 application. All patients (including the control group) underwent a standard physiotherapy program consisting of low back training and spine strengthening and stabilization exercises. The control group received no treatment other than this standard physiotherapy program. In addition to this program, manual treatment was applied to the application grup. The patients were treated for a total of 6 weeks, 2 sessions per week.

The level of pain severity of the participants was determined by Visual Pain Scale (VAS) and Algometry; The level of muscle strength was measured by muscle dynamometer. Oswestry Disability Index for functional evaluation; Beck Depression Inventory for anxiety level; Quality of Life Questionnaire (SF-36) was used for quality of life and Tampa Kinesophobia Scale was used for fear of movement. These assessments were performed at the beginning and end of the 6- week treatment program.

Results: We found statistically significant differences in both groups between the before-treatment and after-treatment results in terms of all evaluation parameters except Tampa kinesiophobia. Manual treatment method has reduced the severity of pain, increased muscle strenght, contributed positively to functional statues, decreased the level of anxiety and depression and improved the quality of life but no improvement in kinesiophobia in patients with chronic low back pain.

Conclusion: In line with our study results, we anticipate that the planned physiotherapy and rehabilitation program and manuel therapy will reduce the health expenditures by finding a solution option for chronic low back pain commonly seen in societies.

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Keywords:

Chronic low back pain, physical therapy, manual therapy, back training, back exercises

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Introduction

Low back pain (LBP) is defined as pain in the posterior region of the lower back. The limits of the low back are the lower edge of the last rib and the iliac crest, with or without leg pain (Vora *et al.,* 2010). Epidemiological studies have shown that 70-80% of people suffer from low back pain at some point in their lives and it takes the first place in chronic painful conditions (Krismer & Van Tulder, 2007). Chronic low back pain (CLBP) is a major health problem worldwide and is associated with high medical costs, lost productivity, and long-term disability (Dagenais et al.,2008; Freburger et al., 2009; Strine et al.,2007). It usually leads to aloss of functionality and of participation in society, loss of work and performance, psychological stress, affecting activities of Daily life and quality of life (Franke & Franke JD *et al*, 2014).

The ability to control pain is very limited in patients with chronic low back pain. It is very difficult for patients to live with chronic low back pain, to regulate family and work relationships and special occupation activities. These patients generally consulted a large number of doctors, underwent many medical evaluations and underwent surgical intervention. Not being able to determine the source of the pain and being told to learn to live with pain gives the patient the idea that a positive result cannot be reached in the treatment and that he will live with pain until the end of his life (VanTulder et al., 1997). Therefore, patients with LBP limit the use of their back and even all physical activities due to the re-injury and fear of pain. Restriction of activities results in functional losses and decreases physical fitness. Stiffness of the ligaments and joints of the vertebral column, loss of flexibility and limitation of the range of motion are seen. Muscle strain and spasm tendency occurs. Without solving these problems of the vertebral column and without improvement in physical fitness there is a risk of recurrence in low back pain. Restriction of physical activity and fear of movement (kinesophobia) cause anxiety, frustration, morale, and depression in individuals about active life and return to work. Especially depression is an important part of chronic low back pain. If one becomes dependent on someone else, they lose their self-confidence and cause deterioration in family and social relations. It even causes him to lose his job and cause economic problems. As a result, patients' whole lives are adversely affected by these problems. Apart from this, the decrease in continuity or decrease in job performance with frequent treatments or reports leads to loss of labor and cost increase for the employer; this causes economic harm in societies.

In the literature, the physiotherapy and rehabilitation methods used for chronic low back pain can be listed as follows:

Treatment of low back pain; conservative treatment and surgical approaches. The aim of conservative treatment is to maximize the patient's current condition. For this purpose, in order to accelerate the return to activity with functional restoration and to reduce the risk of recurrence of low back pain, it becomes important in terms of physiotherapy and rehabilitation of both primary damaged and secondary regions with dysfunction (Narin et al., 2008).

In conservative treatment, short-term bed rest is recommended for acute patients, while rest is not recommended for chronic patients. In these patients, active movement and functional rehabilitation are more important than resting. Especially active movement is a condition of functional rehabilitation (Porter, 2003; Bogduk, 2004; Norastek, 2012).

In low back pain, lumbar corsets are necessary to protect the waist from repetitive positions, to increase the standing balance and to support the waist in the sitting position. Drug treatment and injection treatments are also available (nonsteroidal anti-inflammatory drugs, analgesics, muscle relaxants, antidepressants, etc.). If these approaches are useless, invasive procedures can be applied (Munoz et al., 2010; Mathias, et al., 2010; Deyo, et al., 2009). The most commonly used methods for invasive applications are epidural lysis, epidural steroid injection, intra-disc injections, lumbar sympathetic block, radiofrequency thermoregulation applications (nerve, lumbar sympathetic ganglion, disc, dorsal root ganglion radiofrequency thermoregulation applications), spinal cord stimulation and spinal opid. Other surgical indications are sacral root paralysis due to disc herniation. Relative indications are progressive neurological loss, motor weakness, unbearable severe pain, frequent relapse and a negative response to appropriate conservative treatment (Dündar & Kavuncu, 2006).

In the treatment of patients with chronic low back pain, many physiotherapy and rehabilitation approaches such as hydrotherapy, electrotherapy, massage, thermotherapy, manual therapy, back school, traction and exercise are applied (Henchoz, 2008; Ferreira et al., 2010; Costa et al,. 2009; Unsgaard-Tondel et al., 2010; Saal, 1990). Superficial and deep heat agents are used as thermotherapy in the treatment of patients with low back pain (Özcan, 2000; Öztürk & Akşit, 2004).

Exercise is especially important in the treatment of patients with chronic low back pain. There have been many studies on this (Henchoz & Kai-Lik So, 2008; Ferreira et al., 2010; Costa et al,. 2009; Unsgaard-Tondel et al., 2010; Saal, 1990). Some of these are patient-specific exercises (Norastek, 2012; Henchoz & Kai-Lik So, 2008; Ferreira et al.,2010), PNF (proprioceptive neuromuscular facilitation) exercises (Aydoğan, 2009) dynamic stabilization exercises, Mc-Kenzie extension exercises (Henchoz & Kai-Lik So, 2008), aerobic exercises, flexion-extension exercises, strengthening and flexibility exercises (Henchoz & Kai-Lik So, 2008). Yoga, Tai-chi and pilates are among the exercises that have been used in the treatment of patients with low back pain because it provides core stabilization (Touche et al., 2008; Menacho et al., 2010; Basford et al., 2005). Many randomized trials and clinical practice guidelines have shown that exercise reduces pain and disability in patients, improves function and occupational status, and also reduces recurrence rates (Henchoz & Kai-Lik So, 2008; Ferreira et al., 2010; Costa et al,. 2009; Unsgaard-Tondel et al., 2010; Saal, 1990).

Manual therapy, which is one of the physiotherapy-rehabilitation methods, has been used more widely in clinical practice in recent years although it is a very old treatment method. Manual treatment methods include both diagnostic and treatment techniques. In physiotherapy, manual treatment programs are multimodal rehabilitation programs, which often include exercise, training and recommendations, in addition to manual treatment, and provide individual approach to patients. The general aim of manual treatment is to provide or increase mobility in joints and soft tissues, to accelerate the opening of the adhesions formed and thus gain painless function and to accelerate the person's return to daily life and / or sports by increasing tissue healing capacity (Franke & Franke *et al.,2014*).

The aim of this study was to investigate the effects of manuel treatment in physiotherapy and rehabilitation of patients with chronic low back pain.

Matherial and Methods

Individuals

The aim of this study was to investigate the effects of manual threatment in physiotherapy and rehabilitation of patients with chronic low back pain. The study was conducted between June 2018-February 2019 on 30 individuals who were admitted to Istanbul Esenyurt Necmi Kadıoğlu State Hospital and İstanbul Avcılar Murat Kölük State Hospital Physical Therapy and Rehabilitation Unit and diagnosed with chronic low back pain.

Our study was evaluated by Istanbul Medipol University Non-Interventional Clinical Research Ethics Committee with the Decision Number 10840098-604.01.01-E.5615 on 14/02/2018 and was found suitable for medical ethics.

30 patients, aged between 18-65, who accepted to be included in this study and diagnosed as chronic low back pain, were randomly divided into 2 groups: 1 control and 1 application. All patients (including the control group) underwent a standard physiotherapy program consisting of low back training and spine strengthening and stabilization exercises. The control group received no treatment other than this standard physiotherapy program. In addition to this program, manual treatment was applied to the application grup. The patients were treated for a total of 6 weeks, 2 sessions per week.

Before the study, all participants were informed about the aim of the study, the treatment methods used, the questionnaires to be applied, the duration of the treatment and the assessments to be made both verbally and in writing and the On “Informed Consent Form ” was signed.

The level of pain severity of the participants was determined by Visual Pain Scale (VAS) and Algometry; The level of muscle strength was measured by muscle dynamometer. Oswestry Disability Index for functional evaluation; Beck Depression Inventory for anxiety level; Quality of Life Questionnaire (SF-36) was used for quality of life, and Tampa Kinesophobia Scale was used for fear of movement. These

evaluations were administered to patients at the beginning and end of the 6-week treatment program and the data obtained were recorded.

Inclusion criteria:

- Low back pain for more than 3 months,
- Diagnosis of chronic low back pain by specialist physician,
- No drug use,
- Active in daily life,
- Literate,
- 18-65 years old,
- Volunteer to participate in the study,

Exclusion criteria:

- Spine fracture or dislocation,
- Patients with severe osteoporosis,
- Those with malignancy,
- Rheumatic diseases such as rheumatoid arthritis or ankylosing spondylitis,
- Patients with inflamatory low back pain,
- Patients who have had spine or disc surgery,
- Patients with neurological deficit,
- Patients with structural scoliosis or severe kyphosis,
- Those with advanced spinal stenosis or spondylolisthesis,

Methods

After explaining the purpose of the study and the methods used to the patients who met the inclusion criteria, the participants were signed the Informed Consent Form and the treatment was started. Before starting the treatment, In the first session, the questionnaires used in the treatment were filled in by the participants and necessary measurements were made. After the measurements, treatment program was applied. At the end of the 6-week treatment program, the following evaluation parameters were re-applied to the participants.

The following parameters were used in the evaluation:

1. Sociodemographic evaluation
2. Pain
3. Muscle strength
4. Functional evaluation
5. Quality of life

6. Anxiety
7. Kinesiophobia

Evaluation

Sociodemographic Evaluation

Before the treatment, the participants were asked and recorded their name, surname, age, weight, body mass index (BMI), educational status, marital status, income level and occupation.

Pain Assessment

The severity of pain was measured with Visual Analog Scale (VAS) and algometer.

VAS: The visual analogue scale (VAS) consistes of a line, usually 100mm long, whose ends are labeled as the extremes ('no pain' and 'pain as bad as it could be'); the rest of the line is blank. The patients is asked to put a mark on the line indicating their pain intensity (at the present time, over the past week, or over the past 2 weeks, etc.). The distance between that mark and the origin is measured to obtain the patient's score. Sometimes describtive terms, such as 'mild' and 'severe', or numbers are provided along the scale for guidance and the scale is then referred to as a graphic rating scale (Mannion et al., 2007).

The patients were told that the starting point showed no pain, and the ending point showed unbearable pain, and they were asked to mark the severity of the pain in the form. The point marked on the scale was measured with a ruler (in cm) and recorded.

Algometer: Algometer (Dolorimeter) was used to objectively measure pain threshold and pain tolerance. The algometer (Baseline FDK 10) consists of a metal piston with a 1cm diameter round rubber disc attached to a dial measuring pressure in kilograms (kg) and pounds (lb). Algometry was applied vertically to the most painful point by increasing the pressure 1kg / cm2 every three seconds until the patient felt pain. The pressure value causing pain sensation was determined as pain threshold. Three measurements were made within 20 second intervals and the lowest pressure value was recorded as pain threshold (Friction et al., 1985).

Muscle Strength Assessment

Muscle strength was measured by Takei brand back and leg dynamometer.

The Back and Leg Dynamometer consists of a foot chain, a lifting rod made of rigid aluminum covered with comfortable hand grips and a lifting platform. The 61X61cm lifting platform can be easily transported to any work area. The back and leg dynamometer includes springs of high strength and stiffness to guarantee a lifetime of high precision measurement. The dynamometer has a measuring range

of 0-300 kg (Tamer, 2000). Before the test, the patients were explained in detail about the procedure. After placing the legs on the dynamotre table with the knees bent, the patients pulled the dynamometer bar vertically with their hands upwards with the legs stretched, the back straight and the trunk slightly leaning forward, using their legs at the maximum rate. The patients were asked to perform the movement twice and their best grades were recorded.

Functional Evaluation

Back functions of the patients were evaluated using the Turkish version of the Oswestry Disability Index (ODI) questionnaire. Oswestry Disability Index; It consists of 10 items that question daily life activities. These; severity of pain, personal care, lifting, walking, sitting, standing, sleeping, social life, travel and degree of pain change. There are 6 options between 0-5 points for each item. The patient is asked to select the expression that best describes his condition. The maximum score is 50. Accordingly, 0-14 points are considered mild, 15-29 points are considered moderate, and 30 points are considered as severe functional restriction (Yakut et al., 2004). The Oswestry Disability Index was valid in Turkish (Yakut et al., 2004).

Life Quality

Quality of life was measured using the Quality of Life Questionnaire (SF-36), which was rated between 0-100.

Quality of Life Index: Short Form-36, which is frequently used to assess quality of life, provides a wide-angle measurement. The scale consists of eight subscales including physical function, physical role, emotional function, social function, general health, mental health, pain and vitality. Each subscale scores between 0-100 and the scale is directly proportional to the quality of life. 100 points reflect the best health status, while 0 pounds indicate the worst health status (Koçyiğit et al., 1999). The Turkish validity and reliability study of the Quality of Life Questionnaire (SF-36) was conducted (Koçyiğit et al., 1999).

Anxiety Assessment

Anxiety was measured by Beck Depression Questionnaire.

Beck Depression Questionnaire: This scale, which was developed by Beck in 1967 and consisted of 21 questions, consists of seven items using symptoms of sadness, pessimism, past failures, self-indulgence, self-blame in the face of any situation, loss of interest in life and those around it, and suicidal thoughts or desire. depression is tested in six. Each question consists of 4 sentences and 0 points: neutral status, 3: severe depression. The sentences in the content of the scale were prepared by taking the statements of the depression patients who were treated. The score is maximum 63. The validity and reliability of the Turkish language was made by Hisli et al. (Hisli, 1998). Interpretation of scores:

0-13 points: No depression

14-24 points: Moderate depression

25 points and above: Serious depression.

Evaluation of Kinesiophobia

Kinesiophobia was measured with the Tampa Kinesiophobia Scale (Tunca et al., 2011), a Turkish validity and reliability study.

Tampa Scale for Kinesiophobia: The scale, which was developed to measure the fear of movement and re-injury, consists of 17 questions. 4-point Likert score (1paun: Strongly Disagree, 2 points: Disagree, 3 points: Agree, 4 points: Totally Agree) is used for the questions in the scale. Patients receive a minimum score of 17 and a maximum score of 68. The higher the score, the higher the kinesiophobia. In studies, 37 points and above are defined as high kinesiophobia (Tunca et al., 2011).

Physical therapy and rehabilitation

Control Group

Patients in this group were given a standard physiotherapy training consisting of low back training and spine strengthening and stabilization exercises. The control group received no treatment other than this standard physiotherapy program.

Within the scope of the standard physiotherapy program;

• Williams flexion exercises,

• Stretching exercises for lumbar extensors, hip flexors and hamstrings,

• Strengthening exercises for abdominal muscles,

• Strengthening exercises for back extensors,

• Strengthening exercises were applied to the muscles around the hips.

Each of the above exercises was performed by the patients with 10 repetitions under the supervision of the physiotherapist.

Within the scope of back training;

- Anatomy and function of the spine,
- Posture training,
- Ensuring proper posture during daily activities,
- Back health protection techniques were given as presentations and demonstrations and these

individuals were trained on these issues.

Back training was given in 2 sessions for each group for a total of 30 minutes before treatment.

Manual Treatment Group

Patients in this group were given standard physiotherapy and manual therapy in addition to low back training.

The following procedures were applied to the patients as manual treatment.

- Classical soft tissue massage
- Lumbar region mobilization
- Lumbar region manipulation

Classical Soft Tissue Massage: The patient was laid on the treatment table. His clothes were stripped so that the lumbar area was naked. A thin pillow or folded towel was placed under the patient's waist. When the upper extremity of the patient was in the opposite T position, the head was turned freely to one side. The physiotherapist placed his fingertips on the lumbar paravertebras of the patient while standing on one side of the treatment bed. All palms and fingers were exited longitudinally with deep stroking from both sides of the vertebra. Slightly over the lumbo-thoracic border, the hands descended transversely laterally and the hands were brought closer to each other in a full waist-cup. This method was continued and 10 min classical massage was applied.

Lumbar region mobilization: The following mobilization techniques were applied to the participants:

- **Sustained Natural Apophyseal GlideS (SNAGs):** When the patient was in the sitting position, the mobilization belt was placed on the lower abdomen of the patient and the therapist's waist was placed in the appropriate position. The patient was asked to perform full trunk flexion. A constant force was applied throughout the movement, without interrupting hand contacts, with the therapist's hands on the facet joints and spinous protrusions. The applications were performed in one set and 10 repetitions while the patient was going to flexion and extension.
- **Central Postero-Anterior (PA) Technique:** The patient extends to the prone treatment table. The physiotherapist applies pressure by placing the palms of the palms on the processus spinosus in the lumbar region of the patient. Applications were performed in one set and 10 replicates.

Lumbar Region Manipulation: Patients underwent high velocity and low amplitude (HVLA) or grade 5 manipulation to the lumbar region.

The patient was placed on the side lying on the treatment bed, the lower leg was extended and the

upper leg was flexed from the hips and knees and the trunk was rotated contralaterally. The physiotherapist placed one of the forearms on the patient's hip with the fingers located on the patient's supralateral transverse process of lumbar vertebrae; and the other forearm placed on the chest and axillary region. With the help of the forearm placed on the hip of the patient, the physiotherapist passively rotated the patient's hip until the end of the range of motion and then physical therapist applied grade 5 manipulation.

Statistical analysis

SPSS 25 program was used for statistical analysis. The qualitative variables of the groups were summarized by number and percentage, and the quantitative data were summarized by the mean and standard deviation if they were normal distribution, and by the median, 25th and 75th percentiles if they were not suitable for normal distribution. Categorical variables were analyzed by chi-square test. The comparisons between the groups were examined by using ANOVA for the variables with normal distribution assumption, LSD post hoc tests with significant differences, and Kruskal Wallis with the Mann Whitney U test. In the first and after measurements, variables that fit the normal distribution were examined by t test in dependent groups and variables that did not fit the normal distribution were examined by Wilcoxon paired sample test. Statistical significance was set at $p < 0.05$.

Findings

30 patients, aged between 18-65, who accepted to be included in this study and diagnosed as chronic low back pain, were randomly divided into 2 groups: 1 control and 1 application.

In the control group, all variables except Tampa kinesiophobia were statistically significant.

Tablo 1 Comparison of before-after measurements in the control group.

	Before	After	t or Z	p
VAS Rest	5 (3-6)	2 (1-3)	-3.401	0.001
VAS Aktivity	6 (5-7)	3 (2-3)	-3.453	0.001
VAS Night	6 (5-7)	1 (0-2)	-3.431	0.001
Algometer	4.2±1.7	6.5±1.5	-11.571	<0.001
Dinamometer	39 (34-50)	59 (51-82)	-3.411	0.001
Tampa Kinesiofobia Total	41.3±5.3	41.9±5.6	-0.395	0.699
Oswestry Total	16.3±6.4	8.2±4.4	7.612	<0.001
BECK Total	19.9±10.6	11.8±9	4.837	<0.001
Physical Functioning	60 (45-80)	80 (75-85)	-2.626	0.009
Role physical	0 (0-50)	50 (50-75)	-2.708	0.007
Role emotional	0 (0-33.3)	66.7 (33.3-100)	-2.987	0.003
Vitality	40±16.1	61±13.9	-7.964	<0.001
Mental Health	60 (56-64)	72 (56-76)	-2.596	0.009

Social Functioning	50 (37.5-75)	75 (62.5-75)	-2.784	0.005
Bodily Pain	35 (22.5-45)	67.5 (65-77.5)	-3.220	0.001
General Health	45.3±17.7	56±12.8	-2.978	0.010

* T test or Wilcoxon rank test in dependent groups

In the manual therapy group, all variables except Tampa kinesiophobia were statistically significant.

Tablo 2 Comparison of before-after measurements in manual therapy group

	Before	After	t or Z	p
VAS Rest	5 (4-7)	2 (1-3)	-3.421	0.001
VAS Activity	8 (6-8)	3 (2-4)	-3.426	0.001
VAS Night	5 (3-8)	0 (0-1)	-3.424	0.001
Algometer	3.9±1.2	7.8±1.4	-15.020	<0.001
Dinamometer	58 (34-115)	94.5 (50.5-133)	-3.409	0.001
Tampa Kinesiofobia Total	41.9±9.3	37.8±8.8	1.828	0.089
Oswestry Total	17.3±6.9	8.1±4.7	6.108	<0.001
BECK Total	20.6±10	11.3±8.6	3.064	0.008
Physical Functioning	65 (40-80)	85 (75-90)	-2.949	0.003
Role Physical	0 (0-75)	50 (50-100)	-2.362	0.018
Role emotional	33.3 (0-66.7)	66.7 (33.3-100)	-2.136	0.033
Vitality	29.3±16.6	57±20.6	-4.228	0.001
Mental Health	44 (20-56)	64 (56-80)	-3.049	0.002
Social Functioning	50 (12.5-62.5)	75 (62.5-87.5)	-2.998	0.003
Bodily Pain	32.5 (10-45)	67.5 (45-80)	-3.244	0.001
General Health	35.3±24.5	55.3±26.6	-3.464	0.004

* T test or Wilcoxon rank test in dependent groups

Discussion

The main goals of CLBP treatment are to reduce pain, to improve soft tissue flexibility due to spasm and tension, to increase strength and endurance of the trunk stabilizers, and to improve mobility and posture, thereby, leading to improved functional capacity, better ability to perform activities of daily life, and prevention of work loss (McGill, 1998; Simmonds et al., 1998) Many methods such as resting, medical treatment, back school, hydrotherapy, massage, thermotherapy, manuel therapy, traction, exercise programs, physical therapy modalities, and manipulation are used in the treatment of CLBP (Chou et al., 2007; Negrini et al., 2006; Poitras et al., 2008) Among them, manual therapy has become a recommended treatment option to manage LBP, according to new clinical practical guidelines for American College of Physicians (R. Chou et al., 2017; D. Dowell et al., 2016) Manual therapy is a common and standard treatment for LBP which has been used by approximately 70% of clinicians such as physical therapists, osteopathic physicians and chiropractors in orthopedic seetings (J.E. Bialosky et al., 2009; C. E. Ladeira et al., 2015; A.H. Slattengren et al., 2017; R. Chou et al., 2007; R. Chou et al., 2007).

As recommended in the literature, we used manual therapy techniques in the treatment of patients with chronic low back pain. This study showed that both physical therapy (control) and manuel treatment programme improved pain, function, muscle strenght, quality of life and anxiety in patients with chronic low back pain.

Evidence-based studies have shown that spinal manual therapy is an effective method in the treatment of patients with chronic low back pain, and it provides significant improvements in pain and functional status. In a randomized controlled study in which Aure et al. Examined the effects of exercise therapy (stretching, strengthening, coordination and stabilization of the waist, leg, and hip circumference) and manual therapy (spinal manipulation, mobilization and stretching) in patients with chronic low back pain, pain (VAS) in both groups , functional evaluation (Oswestry disability index) and overall health related parameters. In the comparison between the groups, they obtained a better result in the parameters in the manual therapy group.

Spinal manipulation and exercise are important modalities that play a central role in the treatment of CLBP (Cuesta-Vargas et al., 2011) Some studies have found that the treatment of CLBP with spinal manipulative therapy may significantly decrease pain and improve function. Therapeutic exercise has also been shown to provide improvement on pain and functioning (Bronfort G et al., 2011; Cecchi F et al., 2010; Cecchi F et al., 2010;). In a meta-analysis, the patients with CLBP treated with exercise therapy showed a significant improvement in terms of pain and functional status, compared to the patients who received no treatment or other conservative treatments (Van Tulder et al., 2000).

(Goldby et al., 2006) found that spinal stabilization exercises were more effective than manual therapy in reducing pain intensity and disability and dysfunction. Interestingly, manual therapy was more effective in reducing pain in patients with the highest intensity. (Krekoukias et al., 2017) investigated the efficacy of manual therapy in patients with low back pain due to disc degeneration. They applied spinal mobilization to the first group, sham mobilization to the second group, and conventional physiotherapy to the third group. Passive physiological and accessory movements were applied to the level with disc degeneration as mobilization, while TENS, massage and stretching exercise were applied as conventional physiotherapy program. Mobilization has proven to be superior to conventional physiotherapy in improving pain severity and disability.

In our study, we applied a standard physiotherapy program to both control and manual treatment groups. In addition to the manual treatment group, we applied soft tissue massage, mobilization and manipulation techniques. The VAS and algometer were used to assess the pain severity and the ODI was used to evaluate the functional status. We found significantly higher improvements in the VAS and ODI scores in both physical therapy and manuel treatment grup.

In the study of (Dündar et al., 2009) stated that the quality of life of individuals with chronic low back pain was worse than those without pain and that psychiatric evaluations of patients with chronic low back

pain would improve their quality of life. In our study, we used the Beck Depression Scale to examine the psychological and depression status of the patients.

(Saracoglu et al.,2019) 69 participants were included in their study to investigate the effect of manual therapy and neuroplastic pain education in patients with chronic low back pain. They used the Numerical Pain Scale to assess the severity of pain, the algometer for pressure pain threshold measurement, the Oswestry Disability index to determine the functional level, and the Tampa Kinesiophobia Scale to determine the kinesiophobia levels. As a result, in all groups, pain level decreased, pressure pain threshold increased, functional level improvement and kinesophobia decreased.

We obtained similar results in our study. In both the control group and the manual therapy group, we achieved decreased pain levels, improved functional level, and increased pressure pain threshold. However, in our study, Tampa kinesiophobia values were not statistically significant in both groups.

In studies conducted, it has been proved that muscle strength decreased in patients with chronic low back pain compared with healthy control group (Gibbons et al. 1997, Lee et al. 1994, Ramos et al. 2016). We measured the leg and back muscle strength of the participants with a dynamometer before and after treatment. We found that muscle strength was statistically significant in both the control group and the manual treatment group.

Results

- Manual treatment method has reduced the severity of pain in patients with chronic low back pain.
- Manual treatment method increased muscle strength in patients with chronic low back pain.
- Manual treatment method has contributed positively to functional evaluation of patients with chronic low back pain.
- Manual treatment method decreased the level of anxiety and depression in patients with chronic low back pain.
- Manual treatment method has improved the quality of life of patients with chronic low back pain.

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THE ATTITUDES OF THE STUDENTS STUDYING IN THE FIELD OF HEALTH SCIENCES ON THE USE OF TECHNOLOGY IN EDUCATION

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Abstract

Introduction: The complexity of educational content, the increase in the number of students, the lack of academics and individual differences have led to the use of technology in education more frequently. Through the use of technology in education, a higher quality education has started to be provided and the working quality of the potential labor force group has also increased.

Aim: The study aims to determine the attitudes of the students, studying in the field of health sciences, towards the use of technology in education and to determine and develop the most effective education method by the students.

Method: The study, which was planned in descriptive research type, was carried out with 208 students studying and volunteering in Beykent University, School of Health Sciences between December and January 2019. The data were collected meticulously by determining the most appropriate time for each student with the questionnaire developed by the researchers upon reviewing the relevant literature. Before the questionnaire, the purpose of the study was explained to the students and they were asked to complete the questionnaire fully and carefully. By utilizing the IBM SPSS Statistics 22 program, data were analyzed using descriptive and inferential statistical techniques.

Results: Of the students included in the study, 108 (51.9%) stated that they frequently used technology while they were studying, and 110 (52.9%) stated that they wanted the courses to be computer-aided, and 154 (74.0%) of the students think that the use of technology facilitates learning, and 156 (75.0%) think that the quality of education can be improved by using technology in education. 88.5% of the students think that the use of technology in education is helpful and 28.8% find it interesting. Depending on their department, according to the students' opinion about the use of technology, there was a statistically significant difference ($p < 0.05$). It was stated that 24 (57.1%) of the students studying health care management frequently used technology, and 36 (57.1%) of the students studying nursing used it partially.

Conclusion: The majority of the students participating in the study think that the use of technology in education makes learning easier and the quality of education can be improved through technology. Since we live in the age of technology, it is recommended to increase the use of technology in educational curricula.

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Keywords:

Technology, education, university student, health education

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Introduction

Advances in technology lead us to restructuring by giving new qualities to the world we live in. This situation reflects to all areas of social life, with a speed that requires monitoring change. In line with the rapidly changing world order, societies are expected to keep up with change at the same rate. (Bahçekapılı, 2011). While the society is trying to keep up with the changes with social, economic and human institutions, the education system is one of the areas that should renew itself. The abundance of the beneficiaries of educational services, as well as the rapid increase in information, has left educators in a position to offer more information to more students in less time. Therefore, in order to make education systems more efficient, continually questioning and examination of the ways of modernization come to the agenda, and it is necessary to develop new educational techniques and methods (Akolaş, 2009; Saban, 2007). As a matter of fact, growing up in a world intertwined with technology affects and changes the learning styles of today's youth. These young people call themselves digital natives, stating that they grow up in a world intertwined with technology. Rather than learning through traditional presentation, students now need an environment in which there are many stimuli in the learning environment and can play an active role in the learning process (Prensky, 2008). Thus, in order to support the learning needs and styles of the students, renewal of the elements of the education system in line with today's conditions comes to the agenda. In this process, technology is seen as an appropriate tool that can be used to meet the needs of students in educational environments. When examined, it is seen that technology has been used in educational environments to solve practical problems encountered in learning. This approach, called educational technology, is the application of technological processes and tools that can be used to solve the problems of teaching and learning fields (Kısa and Kaya, 2006;Zayim et all. 2006 Newby et all, 2006). In this sense, technology acts as a bridge between educational scientists and students and teachers who face practical learning difficulties. As a result, educational technology refers to the principles, processes and products used to improve the learning of teachers and students (Newby et all, 2006). Roblyer (2006) summarizes the need for using technology in education in four titles. These are; motivation, enriched learning methods, efficiency and the necessity of the information age. For these reasons, it is expected that learning environments will be integrated with technology in order to help ensure higher learning. In the light of this information; the aim of the study was to evaluate the attitudes and thoughts of students studying in the field of health sciences regarding the use of technology in education.

METHOD

The Aim and Type of the Study

This study was conducted as a descriptive study in order to evaluate the opinions of students studying in the health sciences of a foundation university in Istanbul on the use of technology in education. In addition, it is aimed to determine the frequency of technology use in education and to reveal the students' opinions about the most effective education method.

Research Questions

- Are educational technologies utilized in health education?

- Are the students satisfied with the use of technology in education?
- What are the most effective educational technologies used in health education?

Population of the Research and Sample Selection

The population of the study consisted of students studying in the field of health sciences in the 2018-2019 academic year of a foundation university in Istanbul. In this study, no sample selection was made and it was aimed to reach all students studying in the field of health sciences. As a result, 208 volunteer students were the sample of the study.

Data Collection Tools

The data was collected meticulously by the researchers using the "Structured Student Form'' which was developed by investigating the relevant literature and by determining the best time for each student. Before applying the questionnaire, the students were informed about the purpose of the study, informed consent was obtained and they were asked to answer the questionnaire completely and carefully.

Structured Student Form

The questionnaire prepared in accordance with the literature consists of two parts. The first part of the questionnaire contains questions about the sociodemographic characteristics of students such as age, gender, and so on; and the second part contains questions about the place of technology in their education such as the most frequently used technological tools of the students, the extent to which they have benefited from the technology while studying or doing research, the most commonly used tools in their education, the method by which they can learn the courses they have taken.

Evaluation of Data

The data obtained from the study were analyzed by using SPSS (Statistical Package for Social Sciences) for Windows 22.0. Number and percentage were used as descriptive statistical methods in the evaluation of the data. Chi-square analysis was used to compare the grouped variables.

Ethical Aspects of Research

The required institution permission and the ethics committee permissions (from T.R. Ministry of Health, University of Health Sciences, Istanbul Education Research Hospital, Clinical Research Ethics Committee, with the decision no. 1594 dated 21.12.2018) were obtained for conducting the study. The undergraduate program students were informed about the purpose and expectations of the study in accordance with the Helsinki Declaration and their written consent was obtained.

Limitations of Research

The study only includes students studying at a foundation university in Istanbul. For the results of the research to have a widespread effect, it is necessary to work with a larger sample group.

RESULTS

102 (49%) of the students who participated in our study were between the ages of 20-21, 165 (79.3%) were women, 63 (30.3%) were enrolled in the nursing department and 125 (60%) were living with their families. (Table 1).

Table 1: Sociodemographic Characteristics of Students (N:208)

Properties	Groups	Frequency(n)	Percentage (%)
Age	18-19	81	38,9
	20-21	102	49,0
	22-23	20	9,6
	24 and older	5	2,4
Gender	Male	43	20,7
	Female	165	79,3
Department	Nursing	63	30,3
	Healthcare Management	42	20,2
	Physiotherapy and Rehabilitation	50	24,0
	Nutrition And Dietetics	53	25,5
Stay in/with	in Dormitory	35	16,8
	with Flatmate	42	20,2
	with Family	125	60,1
	in Public Housing	2	1,0
	Others	4	1,9
	Total	208	100,0

When the participants' opinions about technology were evaluated; 205 (98.6%) of the participants stated that the most used technological device is telephone, 66 (32%) of them stated that they have computers, 108 (51.9%) of them stated that they use technology frequently while studying, 184 (88.5%) of them stated that the use of technology in education is beneficial, 152 (73.1%) of them stated that computer is the most used technological device in educational activities, 110 (52.9%) of them stated that they partially support computer aided courses (Table 2).

182 (87.5%) of the students who participated in the study stated that the most comfortable learning style was visual expression, 178 (85.6%) of them said that simulation technology should be used in health education, 170 (81.7%) of them said that simulation technology improves the quality of education, however; 134 (64.4%) of them stated that they did not receive course with simulation (Table 2).

156 (75.0%) of the students think that the use of technology in education increases the quality and permanence of education and 154 (74.0%) of them think that the use of technology makes learning easier (Table 2).

Table 2: Distribution of Attitudes Towards Technology Use in Education (N:208)

	Groups	Frequency(n)	Percentage (%)
Most commonly used technological tools	Telephone	205	98,6
	Computer	66	31,7
	Television	20	9,6
	Tablet Pc	18	8,7
	Others	1	0,5
Frequency of Using Technology While Studying	Very Often	64	30,8
	Often	108	51,9
	Partly	29	13,9
	a Bit	6	2,9
	Never	1	0,5
Computer Aided Courses	Yes	74	35,6
	Partly	110	52,9
	No	24	11,5
Tools used in educational activities	Projection	186	89,4
	Video	83	39,9
	Film Documentary	21	10,1
	Computer	152	73,1
	Simulation Laboratories	18	8,7
	Model Laboratories	128	61,5
	Others	19	9,1
The most comfortable way to learn the lessons learned for education	Verbal Lecture	93	44,7
	Visual Expression	182	87,5
	Auditory Expression	86	41,3
	Tactile Expression	78	37,5
	Others	1	0,5
Using Simulation in Education	Yes	24	11,5
	Partly	50	24,0
	No	134	64,4
Using Simulation in Health Education	Usable	178	85,6
	Partly Usable	28	13,5
	I Don't Know What Simulation Is.	2	1,0
Simulation Improves Students' Quality in Education	Yes	170	81,7
	Partly	36	17,3
	No	2	1,0
Opinion about Using of Technology in Education	Useful	184	88,5
	Complex	16	7,7
	Interesting	60	28,8
	Difficult	2	1,0
	Unnecessary	1	0,5
	Others	1	0,5
Does the use of technology improve the quality and effectiveness of education?	Yes	156	75,0
	Partly	49	23,6
	No	3	1,4
Does the use of technology make learning easier?	Yes	154	74,0
	Partly	53	25,5
	No	1	0,5

When the technology usage is compared according to the departments of the participants, there was a significant relationship between computer aided courses and students' department. ($p<0.005$) 24 (57%) of healthcare management students stated that the courses should be computer-aided. 60 (95%) of nursing students believe that

simulation should be used in health education and 33 (79%) of healthcare management students argue that learning is facilitated by using technology in education (Table 3).

There was no significant relationship between the frequency of using technology while studying and using simulation technology in education. (X^2=9,839; p=0,630>0.05). (Table 3).

Table 3. Distribution of Attitudes Towards the Use of Technology by Department (N:208)

		Nursing		Healthcare Management		Physiotherapy and Rehabilitation		Nutrition And Dietetics		p
		n	%	n	%	n	%	n	%	
Frequency of Using Technology While Studying	Very Often	16	%25,4	16	%38,1	14	%28,0	18	%34,0	X^2=9,839 p=0,630
	Often	31	%49,2	22	%52,4	28	%56,0	27	%50,9	
	Partly	14	%22,2	3	%7,1	6	%12,0	6	%11,3	
	a Bit	1	%1,6	1	%2,4	2	%4,0	2	%3,8	
	Never	1	%1,6	0	%0,0	0	%0,0	0	%0,0	
Computer Aided Courses	Yes	19	%30,2	24	%57,1	19	%38,0	12	%22,6	X^2=14,144 p=0,028
	Partly	36	%57,1	15	%35,7	24	%48,0	35	%66,0	
	No	8	%12,7	3	%7,1	7	%14,0	6	%11,3	
Using Simulation in Education	Yes	6	%9,5	4	%9,5	10	%20,0	4	%7,5	X^2=9,640 p=0,141
	Partly	17	%27,0	6	%14,3	15	%30,0	12	%22,6	
	No	40	%63,5	32	%76,2	25	%50,0	37	%69,8	
Using Simulation in Health Education	Usable	60	%95,2	33	%78,6	45	%90,0	40	%75,5	X^2=13,665 p=0,034
	Partly Usable	3	%4,8	9	%21,4	4	%8,0	12	%22,6	
	I Don't Know What Simulation Is.	0	%0,0	0	%0,0	1	%2,0	1	%1,9	
Simulation Improves Students' Quality in Education	Yes	58	%92,1	34	%81,0	38	%76,0	40	%75,5	X^2=14,577 p=0,024
	Partly	3	%4,8	8	%19,0	12	%24,0	13	%24,5	
	No	2	%3,2	0	%0,0	0	%0,0	0	%0,0	
Use of Technology to Improve Education Quality	Yes	51	%81,0	35	%83,3	35	%70,0	35	%66,0	X^2=6,108 p=0,411
	Partly	11	%17,5	7	%16,7	14	%28,0	17	%32,1	
	No	1	%1,6	0	%0,0	1	%2,0	1	%1,9	
Using Technology to Facilitate Learning	Yes	50	%79,4	33	%78,6	34	%68,0	37	%69,8	X^2=5,623 p=0,467
	Partly	12	%19,0	9	%21,4	16	%32,0	16	%30,2	
	No	1	%1,6	0	%0,0	0	%0,0	0	%0,0	

No significant relationship was found between students' use of technology and gender (X^2=1,315; p=0,859>0.05). 52 (31.5%) of the female students used the technology very frequently while studying, 23 (37%) of the male

students stated that the courses should be partially computer supported, 136 (82%) of the women stated that using simulation in education will improve the quality of education, 33 (77%) of the male students support the use of technology to increase learning. It was found that 65.5% of female students did not use simulation applications in their education (Table 4)

Table 4. Comparison of Technology Use with Gender (N:208)

		Male		Female		p
		n	%	n	%	
Frequency of Using Technology While Studying	Very Often	12	%27,9	52	%31,5	X^2=1,315 p=0,859
	Often	22	%51,2	86	%52,1	
	Partly	8	%18,6	21	%12,7	
	a Bit	1	%2,3	5	%3,0	
	Never	0	%0,0	1	%0,6	
Computer Aided Courses	Yes	16	%37,2	58	%35,2	X^2=0,279 p=0,870
	Partly	23	%53,5	87	%52,7	
	No	4	%9,3	20	%12,1	
Using Simulation in Education	Yes	7	%16,3	17	%10,3	X^2=1,201 p=0,548
	Partly	10	%23,3	40	%24,2	
	No	26	%60,5	108	%65,5	
Using Simulation in Health Education	Usable	36	%83,7	142	%86,1	X^2=0,863 p=0,650
	Partly Usable	7	%16,3	21	%12,7	
	I Don't Know What Simulation Is.	0	%0,0	2	%1,2	
Simulation Improves Students' Quality in Education	Yes	34	%79,1	136	%82,4	X^2=0,979 p=0,613
	Partly	9	%20,9	27	%16,4	
	No	0	%0,0	2	%1,2	
Use of Technology to Improve Education Quality	Yes	32	%74,4	124	%75,2	X^2=0,298 p=0,862
	Partly	10	%23,3	39	%23,6	
	No	1	%2,3	2	%1,2	
Using Technology to Facilitate Learning	Yes	33	%76,7	121	%73,3	X^2=4,331 p=0,115
	Partly	9	%20,9	44	%26,7	
	No	1	%2,3	0	%0,0	

DISCUSSION

Since health education is a comprehensive field that requires the acquisition of cognitive, psychomotor and affective behaviors, it is important to use innovative applications in education (Melnyk, 2011); (Terzioğlu, 2012) These applications increase the attention of the students, save the education from the monotony and ensure the permanence of the teaching by ensuring the active participation of the student (Şendir and Doğan 2015). Because today is the age of technology, the use and development of new learning tools has increased in every stage of the nursing education process (Edeer et all 2015); (Göriş et all 2014). These developments in technology and education, have bring along the coexistence of these two areas and they have given the opportunity to use educational technologies, which are widely used to increase technical and non-technical skills in nursing education. The majority of the students who participated in our study reported that the most frequently used technological device is the telephone and 66 (32%) of them stated that they have computers. Studies indicated that the most common technological devices used by university students are telephone and computer. (Koç, 2006); (McCoy et all 2001), in his study with nursing students, stated that 26.6% of the students have computers, 76.6% of them stated that they need to used the computer and 85.9% of them use computers. McCoy et all. (2001) found that 73% of the students like the computer.

With the developing technology, higher education institutions started to renew their curricula. In this context, the use of technology in education has become widespread in order to meet the learning needs of the Z generation, which is called the digital generation.

When the participants' opinions about technology were evaluated; 108 (51.9%) of the students stated that they frequently use technology while studying, 184 (88.5%) of them stated that the use of technology in education is beneficial, 152 (73.1%) and 110 (52.9%)of them stated that they partially supported computer supported courses.With the studies, it is revealed that the new generation students are technology-friendly and want to use the technology in education as in all fields (Akcan et all., 2007; Fidancıoğu et all 2009; Yavuz and Coşkun 2008). Mutlu (2012) stated that technology-based education has a positive effect on students' motivation, attitude and achievement in thesis, Yavuz and Coşkun (2008) found that students 'use of technological tools in teaching affected students' attitudes positively and as a result of the interviews, it was determined that the students had positive ideas about the use of technology.

At every stage of the innovative education processes, educational methods and materials with different technological infrastructure are used. The most commonly used technological methods in education are web based education, distance education and simulation. The complex structure of the health system, the lack of existing academics, the inadequacy of clinical internships and the complexity of theoretical education make health education difficult. However, despite all these problems, the use of simulation and other technologically supported education have an important place in health education. (Sarı, 2017). 182 (87.5%) of the students who participated in the study stated that the most comfortable learning style was visual expression, 178 (85.6%) of them stated that simulation technology should be used in health education, 170 (81.7%) of them think that simulation technology improves the quality of education. Baptista et all. (2016), in a study conducted with nursing students, found that students who participated

in medium and high reality simulation applications had higher educational satisfaction and decision-making skills. In Cobbett and Snelgrove-Clarke (2016) studies, it was found that anxiety levels of students studying with simulation were lower. In Fawaz et all. (2016) studies, statistical motivation and clinical decision-making rates differed among students who received high-grade simulation and traditional classroom education.

156 (75.0%) of the students who participated in our study think that using technology in education increases quality and permanence in education and 154 (74.0%) of them think that the use of technology facilitates learning. Studies have shown that the integration of education with technology will be beneficial for both educators and students (Broussard, 2009; Fidancıoğlu, 2009; Tuzer, 2016). The majority of the students who participated in the Fidancıoğlu and Beydağı (2009) study stated that the use of computers and the internet is necessary for their professional development.

CONCLUSION

The rapid development of communication and information technologies has led to the formation of information societies and it has created a wide range of information and service opportunities. With the development of technology, computers have become an inevitable element in human life and their use in educational environments has become a necessity. The complex structure of computers has brought together more features than other educational technologies used in educational environments. Because of these features, there are many benefits of using computers in educational environments. According to the results obtained from the literature, it has been observed that the quality of education has increased with the use of technology in health education. It is thought that general satisfaction and knowledge levels will increase with increasing technology-based education, and anxiety levels will decrease in clinic and practice. It is recommended that the study be conducted with students who study in different fields and with more samples.

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CRONOBACTER SAKAZAKII: AN EMERGING PATHOGEN IN FOOD SAFETY

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Abstract

Cronobacter sakazakii is a pathogen that causes fatal infections like necrotizing enterocolitis, and meningitis, especially in preterm and microsomic infants. Even though traces of the C. sakazakii has been detected in various food samples and other environmental sources, only contaminated powder infant formulas have been epidemiologically associated with infections caused by C. sakazakii. However, exposure to environmental and foodborne C. sakazakii species, pose a serious human health risk. Nevertheless, to be able to point out the importance of this issue and its widespread impact, there is a need for a significant number of studies about the detection of C. sakazakii species by rapid and sensitive molecular methods which are not available in our country for now.

The molecular examination of the virulence of each of the steps of food, such as production, harvesting, storage, processing, commercialization, and privatization, is important for the protection of consumer health and prevention of diseases caused by Cronobacteria. Molecular identification methods are one of the most important innovations for developing technology in the field of microbiology. The addition of new molecular identification techniques day by day is of great benefit to scientific studies carried out for different purposes.

Thus, this review was conducted to draw attention to public health risks that may be caused by the pathogenicity and virulence factors of the C. sakazakii.

Keywords:

Cronobacter sakazakii, Molecular Identification, Food Safety, Pathogen, Public Health

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Introduction

Cronobacter sakazakii may lead fatal infections in human body with a mortality rate of 40-80%. Some of these severe infections are necrotizing enterocolitis, bacteremia, and meningitis, in newborns and children in the first three years of their life, and adults with a suppressed immune system. (Heperkan et al., 2017; Demirci, et al., 2018).

Worldwide known, very few superintendence data are available for C. sakazakii-associated ailments because of the lack of attainable information on superintendence systems, which are insufficient to investigate susceptibility factors. The World Health Organization has detected coarsely 120 singly documented contingencies of Cronobacter spp. infections in infants and young children up to three years of age (Ivy R. A. et al., 2013). Registering the information of foodborne pathogenic isolated samples is vital to enhance the number of the identification techniques, treatment strategies, and preventive medical intervention. Foodborne disease superintendence and/or outbreak data classification encompassing C. sakazakii infections have been established in most countries and the data collected through by these systems suggest that mortality results more likely to occur for the new borns so that there is a greater risk factor for infants (FAO/WHO).

A distinct multiplicity of pollutants, which can emerge throughout various phases of fabrication and retention, may be exhibit in formulas and baby foods, bulk of the researches have recounted the existence of C. sakazakii in baby formula, follow-up baby food, growing-up formula, children's formula, semolina, milk powder, starch, and rice flour (Shaker et al., 2007) (Cava Gümüş et al., 2017) (Demirci et al., 2018); dairy powders (Heperkan et al., 2017); dairy products, sahlab, and dust samples (El-Sharoud et al., 2009) herbs and spices (Jaradat et al., 2009); dried herbs and vegetables (Hunter et al., 2013) and frozen food, seafood, spices, and ready-to-eat snacks (Ogihara et al., 2014).

Alternative to breast milk, formulas can be considered as the most important part of a baby's nutrition in the early years of life. Dehumidified formulas have been considered as one of the best fattening place for bacterial growth of C. sakazakii. The appearance of C. sakazakii in infant formula is being considered as a crucial public health problem due to its virulence factors which can cause fatal infections such as enterocolitis and meningitis. In the field of storage, transport, and production, especially by the manufacturers, various measures have to be taken to minimize bacterial contamination of powder products and training is required to reduce the risk of constant contamination of infant food to the caregivers of infants. New born formulas, cereals, dried foods which frequently consumed by infants and children, must be free of C. sakazakii pursuant to national and international authorities. In addition, C. sakazakii contamination has repeatedly been detected in factories processing baby foods and ingredients used for making baby foods (Kim et al., 2010). Dust particles in the air of such a facility may act as a vector of C. sakazakii dissemination. The higher levels of C. sakazakii are mostly observed in dust filters, vacuum cleaners, bagging and packaging areas (Zimmermann et al., 2017)

The Pathogen-Cronobacter sakazakii

C. sakazakii, is a bacterium which belongs to the Enterobacteriaceae family, gram-negative, facultative anaerobic, rod-shaped, does not create sports, moving with peritric flagella. It produces bright or dull colonies on solid medium and colony types are depending on the medium varies (Ivsen et al., 2003). C. sakazakii can grow in a wide temperature range between 6-47 ° C. Ivers and colleagues (2004) found in their research that six strains developed at 37-43 °C and one capsulized strain could grow at 47°C.

Even though, C. sakazakii is resistant to high temperatures, it is stated that standard pasteurization conditions applied in powdered baby food production are sufficient to inactivate many C. sakazakii strains that are resistant to high temperatures (Ivsen et al., 2004; Shaker et al., 2007; Al-Nabulsi et al., 2011; Jaradat et al., 2014). Moreover, it is also reported that the micronutrient adding process into infant food after pasteurization or irrigation might create secondary contamination sources for these microorganisms (Tocay et al., 2008).

C. sakazakii is a microorganism that exhibits significant resistance to low pH levels. In research has been made by Dancer and colleagues in 2009, the growing up ability of C. sakazakii strains in low pH conditions was examined. As a result, it has been observed that, while all strains were able to grow in pH 4.5, at pH 4.3, 4.1 and 3.9 the growing up percentages were 98.6, 95.8 and 79.2% respectively. In another research, it was found that a decrease in the number of living cells in the pH greater than 5 hours in 37 °C was less than 1 logarithmic unit for 10 strains, and in PH 3.0, this decrease was at the level of 4log kob/ml for all strains (Edelson & Mammel et al., 2006). Furthermore, in another study, C. sakazakii has been isolated from different food samples in pH 2.5 and researchers have stated that microorganisms could not continue their liveliness at that pH level (Fakruddin et al., 2014). However, even though the gastric juice pH levels are in between 2-3 (Freeman, et al., 1978), in newborns, especially in premature babies, stomach acid is not fully developed, constitutes a risk.

Pollution of baby food with biological pollutants can affect the health of a newborn or a baby. In addition, since newborns/infants ' immune system and other defense mechanisms are not as advanced as an adult, these pollutions may cause serious health problems and even death. C. sakazakii is a well-known type of Enterobacter that can contaminate dry baby food and baby formula and cause serious poisoning and infections. Various studies made for many years about the isolation of the C. sakazakii have proven that the cases of neonatal meningitis or necrotizing enterocolitis were associated with the ingestion of powdered infant formulas contaminated with C. sakazakii. Furthermore, in other cases, the organism has been isolated from kitchen utensils, like mixers to blend formulas and potential cross-contaminants of baby food. In such cases even though the samples have not been isolated directly from the infant formulas, a relationship is assumed as there may be a risk of cross-contamination from kitchen tools. Recent publications have shown that this microorganism can be found in a wide range of food, water, and environment, including home and hospitals. (Erkekoglu et. al., 2009)

C. sakazakii were found in many foods like meat, vegetables, cheese, seeds, herbs, spices (Ivsen & Forsythe, 2004) despite the fact that food-borne C. sakazakii infections are not common (Lampel & Chen, 2009). Although, the presence of the bacterium in powdered baby food is more important because of the development of the immune system in newborns (Ivsen & Forsythe, 2004) and the high mortality rates observed in infected infants with C. sakazakii (40-80%) (Lampel & Chen, 2009). Although the origin and transmission of infections caused by C. sakazakii in newborn infants are not fully known, it has been suggested that powdered infant food is the main cause of neonatal meningitis (Nazaretroc &White & Farber, 1997, 1999).

According to a prospective review study, has been made for years from 1960 to 1999 of newborn, infant and young children who infected with C. sakazakii, it has been found that 21 of the patients had meningitis, 7 of the patients had bacteremia, 1 of the patients had urinary tract infection, 1 of the patients had diarrhea, and 1 of the patients had dermoid cyst (Lai et. al., 2001). Besides, it has been shown that bacteremia caused by C. sakazakii can occur in all age groups (Bowen et. al., 2008). Burdette and Santos examined a child patients patient who was showing signs of sepsis for 6 days, in 2000 and they have reported C. sakazakii was detected in child's blood, urine, cerebrospinal fluid, and purulent fluid. In another research, samples collected from different facilities evaluated and the presence of the C. sakazakii has been identified in different levels. In eight of the nine factories producing powdered baby food, five of the 16 houses, as well as all the environmental resources in the factories along the line of production C. sakazakii detected (Kandhai et al., 2004). Furthermore, at the same research, presence of C. sakazakii has been detected, in 152 samples of which they obtained from the floor of three milk powder production plants, dried scraps and vacuum cleaning bags (Kandhai et al., 2004). According to another study made by Reich and colleagues at 2010, it has been reported that in the samples they have collected from a company producing powdered baby food, there were 28%, 5.3% and 8% Cronobacter spp. Respectively, in vacuum cleaning points, filling machines and filling band.

Infectious Dose of Cronobacter sakazakii in Food Samples

There is insufficient epidemiological data on the dose of C. sakazakii infection, although Neisseria meningitis, E. coli O157: H7 and Listeria as with monocytogenes, it is stated that the dose of the oral infection can be considered as 1000 units of cells (Parra & Flores et al., 2015). In addition, it has been described that this dose may vary depending on the microorganism's environmental stress conditions,

the host's healthy immune system, and the food content (Iversen & Forsythe, 2003) In a study conducted by Iversen and Forsythe in 2003, 0.36 kob/100g of C. sakazakii containing powder formula used for a meal of the baby food and it has been reported that the prepared food should be kept at 9 days 8 C or 17.9 hours room temperature in order to reach the minimum infection dose. During the calculation, it has been assumed that the microorganisms did not die with the temperature of the water used during the preparation of the food and did not multiply in the stomach (Erkekoğlu, et al., 2009)

Pathogenesis and Virulence Factors

C. sakazakii is a recently differentiated species of the Cronobacter genus. Nevertheless it's virulence marks remain weakly researched (Ye Y. et. al., 2015). Furthermore an enhanced comprehension of this bacterium has begun to define the virulence factors and pathogenic potential of C. sakazakii (Eshwar A. K. et al., 2016). These improvements have been received by developed DNA-based techniques (Eshwar A. K. et al., 2016). Innovational reports have ascertained many virulence factors in C. sakazakii like seven O-serogroups and eleven proteolytic enzymes demonstrating potential linked to virulence. (Erkekoğlu, et. al., 2009). Amid the virulence-related proteins, outer membrane proteins (OmpA and OmpX) take part in the colonization of the gastrointestinal tract and may have impacts in aiding the organism permeate the blood-brain barrier (Ye Y. et al., 2015). The two presumptive virulence factors, Zinc-metalloprotease (zpx) and Cronobacter plasminogen activator (Cpa), hold a major part in vivo pathogenesis. The factor zpx provokes cell distortion and rounding of cells, whilst Cpa providing impedance to the bactericidal activity of serum, triggers plasminogen, and deactivates alpha2-antiplasmin. Consequently, their characterization is essential to allocate pathogenic from nonpathogenic strains. Pursuant to a investigation made in 2015 by Singh et al., the characteristics of popular virulence factors of C. sakazakii driven to genes demonstrated in the Table 1.

Table: 1

Virulance Factors of Cronobacter sakazakii

Factors	Genes	Potential role
Outer membrane proteins (OMPs)	*OmpX-OmpA*	Engaged with the basolateral attack of enterocyte-like human epithelial cells
Enterotoxin	Not known yet	Warmth stable poison explained by the pathogen
Outer membrane protease	*cpa*	Gives opposition against bactericidal action of serum; initiates plasminogen and inactivates α2-AP
Iron acquisition system	*iuc*	Encodes an iron-take-up framework interceded by the dynamic siderophore that assumes a job in iron vehicle and guideline
Efflux system	*ibeB*	Encodes copper and silver obstruction cation efflux framework encouraging intrusion of cerebrum

		microvascular endothelial cells (BMEC)
Proteolytic enzymes	*zpx*	Cause cell twisting and adjusting of cells
Lipopoysaccaride	*Chromosomal encoded genes*	Disturb epithelial tight intersections

Taxonomy

Species in the Enterobacter family representing a heterogeneous and large group have been identified increasingly pathogenic in recent years. In the Enterobacter family, 14 species have been accepted as taxonomical. Among them, C. sakazakii, Enterobacter Gergovia with 9 species in the Enterobacter cloacae complex defined as the main types of infections that cause hospital infections in humans (Dauga & Breeuwer, 2008). In 1929, Pangalos reported a coliform bacteria forming yellow pigment as the cause of septicemia in a baby (Gurtler et al., 2005). C. sakazakii has been reported as the agent of meningitis for the first time by Urmeyni and Franklin.

There are two major grades that have been differentiated in prokaryotic taxonomy, one characterized by the application of phenotypic studies and other one characterized by a focus on genotypic characteristics. In mycobacterial taxonomy, the first technique has been used until 1980s and the second technique which is based on genotypic characteristics has discovered in the 20th century. Nevertheless, even though initial genotypic researches corroborated the authenticity of formerly defined phenotype-based taxonomy, lately, with the progression of the higher technology, the decomposition of some other species and the ex-novo delineation of others resulted. The reasoning of genotypic taxonomy is associated with the determination of eminently protected regions within the genome, comprising hypervariable sequences with specific deletion, placement, or modification of single nucleotides. The 16S rRNA coding gene has existed for many years and is still the primary target of molecular taxonomic studies and plays a small role in some other genomic regions. Even though the function of genetics in the eventual advancement of mycobacterial taxonomy has come to the forefront, the chemotaxonomic research has also promoted vastly to this field. This approach has led to precise results with mycobacteria thanks to the presence of lipids containing unique molecules, such as mycolic acids in the cell wall. As a result of these two developments, in recent years there has been an increase in the number of mycobacterial species identified. It has been shown that DNA profiling techniques for instance ribotiplication and fragment length polymorphisms (AFLP) differ at species and sub-species levels and may cater estimable supplemental data for external studies (Clermont O, et. al., 2001).

AFLP method has been examined in plant and microbiological studies. AFLP describes the molecular ecology of miscellaneous features and this technique can be used to govern the relevance of the species (Iversen C, et. al., 2006). Moreover, in one study, organs of the same genomic strain cluster were determined by AFLP analysis and it was proposed that the unborn genomic delineation of bacterial species could be based on this approximation (Mougel B, et. al., 2002) Furthermore, in another research, separate molecular techniques such as F-AFLP, automatic ribotiplexing, full-length 16S rRNA gene sequencing, and DNA-DNA hybridization were used to clarify the taxonomic relationship of 210 strains identified as C. sakazakii. Consequently, 210 C. sakazakii strains were subjoined to the BioGroup characterize by Iversen and his colleagues with 16 BioGroup defined by Farmer and his colleagues. Hereby, this research, while all C.sakazakii strains have more than 62% pattern resemblance, further C. sakazakii strains have less than 62% pattern similarity In four groups, 1-r, 2-R, 3- R and 4-R, and 16S rRNA groups were used to identify separate sakazakii groups corresponding to 1- 4 with a greater similarity than 70%. DNA-DNA hybridization was implemented with two strains. E sakazakii type strain, ATCC 29544T, demonstrated ATCC 12868, and 70% of DNA homology of the identical category which accounts they belong propounding the consanguinity of DNA 70% which is usually presumed to be the border for species. Despite the fact that the value may seem low, the resemblance between the 16S rRNA gene rotations for these two strains is 99.6% and is thoroughly clustered using F-AFLP analysis and ribotiplication that supports the similar kind

of relationship. Beforehand, DNA hybridization of 13 E. sakazakii strains resulted in an ideal renaturation temperature of 59.5°C at a rate of 72-95% relative binding. Biogroups 5, 9, and 14 isolates were classified as a subgroup of Group 1 in the ribotype analysis and representatives of this subgroup formed a consistent cluster in the F-AFLP analysis. Whereas for the other strains in Group 1, there is no other connection among biogroup and subcluster. Biogroups called 5, 9, and 14 strains demonstrated in 16S rRNA gene sequences (Iversen et al., 2007)

Detection and Typing Methods

Conventional Bacteriological Culture

Early determination method developed for Cronobacter species was described by Muytjens et al in 1988. According to this method, the US Food and Drug Administration (US FDA) proposed a technique for isolating and sequencing C. sakazakii from powdered formula in 2002. In 2006, the International Organization for Standardization (ISO 2009) and the International Federation of Dairy Products drafted a standartizied protocol known as ISO/TS 22964 for the detection of Cronobacter species from milk-based powder formula (Anonymous 2006a, B). More recently, the US-FDA method has been revised for the detection technique to combine both a PCR analysis and two newly developed chromogenic Agars (Chen et al. 2009; Chen 2011). In these three protocols, pre-enrichment of PIF (Powdered Infant Formula) samples tested and the duration varies from a maximum nocturnal period (18 to 24 hours) to a minimum period of 6 hours, followed by selective enrichment and isolating using selective Agars. Typical colonies are confirmed using a selective agar and/or an appropriate real-time PCR test, and final identification is made, either based on biochemical or molecular characterization. An enrichment stage is available in the revised US-FDA protocol, followed by a molecular method later used for rapid confirmation. In this approach, two days are eliminated from the detection procedure compared to the original protocol. Muytjens et al. (1984) to the α-glycosidase enzyme token as defined by (Iversen et al., 2004b) and to the β-selobiosidase activity present in all Cronobacter strains (Restaino et al., 2006) based on Leuschner-Bew Agari (Leuscher and Bew, 2004), Druggan-Fosythe-Iversen Agari (Iversen et al., 2004b), Oh-Kang agar (Oh and Kang 2004), ESPM Agar (Restaino et al., 2006) and Hijrome Cronobacter spp. selective medium for Cronobacter has been developed, including Agar (Sigma-Aldrich, Switzerland). Also, for the isolation of Cronobacter from foods (Druggan & Iversen 2009; Forsythe 2009), purple-red gall Agar (VRBA), Macconkey Agar, and desoxycholate Agar, selective for gram-negative bacteria, are favorable. Nevertheless notwithstanding the approachability of selective Agars, some have been proven to insufficiently prop the escalation of every bacteria strain (Iversen and Forsythe 2007) and other correlated categories of bacteria just as Enterobacter Helveticus, Enterobacter triturates, and Enterobacter turicensis, which can be found in the same ecological family. Thence, accomplishments were needed in the pattern of selective media to isolate and identify Cronobacter. O'brien et al. (2009) suggested the pattern of a one-step pre-enrichment and enrichment protocol in which a chromogenic medium is used. In this identification strategy, the specific medium advanced [referred to as Cronobacter enrichment medium] conducted to the preparation of a short two-day culture method for the detection of Cronobacter species in powdered infant formula. Mullane et al. (2006) utilized a cationic magnetic bead capture technique to boost Cronobacter detection sensitivity from PIF. The precision and authenticity of commercially available Cronobacter identification kits have been questioned by false-negative and false-positive reports (Restaino et al., 2006; Iversen and Forsythe, 2007). Nonetheless, Gen III is the only Identification Kit accessible (Healy, 2010) that contains the pioneer to six species covered.

Molecular-based Detection Protocols

Molecular detection techniques have always been perceived as suitable mechanisms for a enhanced perception of an organism's epidemiology. Typically, these analyses are aforethought to eliminate and aimed exceptional genes present in the pathogen. Plenty of the analysis placement produced with present technology are based on real-time PCR, and some are built for more detailed detection of Cronobacter (Malorny and Wagner, 2005; Seo and Brackett, 2005; Drudy et al., 2006; Nair and Venkitanarayanan, 2006; Kothary et al., 2007; Zhou et al., 2008). Protocols created to detect Cronobacter ease the definition of all seven known species within the genus Cronobacter using a mismatch-PCR-based approach. Utilizations of these molecular, based processes can support conventional culture-based approaches. Even so, using the last process indicated, C. malonaticus and C. sakazakii were not distinguishable by this approach, and therefore a second PCR requirement was

formed to correctly identify each of these species. A study by Yan et al in 2011 found that a PCR and sequence-based biological token validation study was required to detect and identify Cronobacter spp. The researchers aim to shed light on virulence markers that may be useful as biological markers to distinguish Cronobacter spp and Salmonella spp from other food-derived pathogens. Although these assumed markers have been identified, further verification experiments are already being conducted. Molecular subtyping has been recognized as an approach that can be applied to elucidate the nature of these bacteria that colonize a particular ecological niche. The study demonstrated a basis for the improvement of effective interventions to reduce Cronobacter in the PIF production environment. Then, an another approximation developed using Multi-Focus variable-numbered short-sequence Repeat analysis (MLVA), a second-generation subtyping method, was applied to perform subtyping of the archive of different Cronobacter isolates, both genotypic and phenotypic. Yet, a standardized PFGE process is taking a final build, and international laboratory networks for detecting foodborne infections have been validated by PulseNet The list of molecular detection protocols for C. sakazakii defined by Yan et al. in 2011, demonstrated in the Table 2.

Table: 2

Detection Protocols for Cronobacter in Powdered Infant Formula

Procedure	FDA (Original)	ISO/TS 22964	FDA (revised)
Preenrichment	Make1:10 (w/v)sample indistilled water, hatched medium-term at 36oC	Make 1 : 10 (w/v) of test in BPW, brooded at 37°C for 18 ± 2h	Make 1 : 10 (w/v) of test in BPW, hatched at 36°C for 6 h
Selective enrichment	Move 10 ml pre improvement to 90 ml EE soup, brooded medium-term at 360C	Move 100 µl pre-enrichment to 10 ml mLST/vancomycin medium, hatched at 44°C for 24 ±2 h	
Selection/ isolation	Make a disconnection streak and spread plate from every EE stock onto VRBG agar, hatched medium-term at 36°C	Streak from the refined mLST/vancomycin medium one loopful on the chromogenic agar in Petri dishes, brooded at 44°C for 24 ± 2h	Axis 40 ml examples, 3000 g, 10 min and resuspend pellet in 200 µl PBS; Spread 100 µl onto chromogenic media, brooded medium-term at 36°C
Confirmation	Pick five hypothetical positive provinces and streak onto TSA, hatched medium-term at 25°C	Select five run of the mill settlements and streak on TSA agar, brooded at 25°C for 48 ± 4 h	Pick two regular states from each chromogenic media affirmed with real-time PCR, Programming interface 20E, Fast ID 32 E

Identification	Yellow provinces are affirmed with the API 20E test kit	Select one yellow province from every TSA plate for biochemical portrayal	
Detection time (hrs)	120	144	72

Conclusion

Cronobacter species are an of late ordered class, and there are insufficient examines have been made to completely comprehend this one of a kind gathering of creatures. Precise recognition and legitimate ID of nourishments and clinical situations are most significant hotspots for information accumulation. Consequently, atomic procedures are regularly simpler and quicker when contrasted with ordinary microbiological (phenotype) based techniques. But endeavors have been made to refresh databases for accessible spotting frameworks, upgrades can be made in the recognizable proof and separation of Cronobacter species. The requirement for specific instruments and administrator preparing discourages a few analysts to pursue these conventions well ordered. By and by quick demonstrative conventions are urgent in the clinical use. The execution of practices, for example, proteomics, similar genome examination, transcriptomics and bioinformatics is important to reveal complex contacts between the pathogen and host. Also, there is next to no that researchers think about the danger variables and pathogenicity of Cronobacter species in vivo, which is the most significant part for restorative treatments. Another methodology and vision to the movement and pathogenesis of maladies related with Cronobacter species is required. Especially use of the in vitro cell-based examinations joined with creature model investigations ought to be researched further. Hence, transmission and conveyance of new innovations, conventions, and sanitation issues to industry, specialists, scientists, and purchasers ought to contemplate.

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EVALUATION OF ROOT FRACTURES OF EXTREMELY DAMAGED TEETH AFTER ENDODONTIC TREATMENT

Haluk Kurtulmuş[1]

Abstract

It is known that endodontically treated teeth are more fragile than vital teeth. Loss of each substance in the tooth due to canal treatment and opened cavities increases the brittleness of the crown of the tooth. Incomplete apex teeth, advanced caries and overdosed canals cause restorative problems for dentists. The success of endodontically treated teeth depends on the structural, aesthetic and prosthetic success of the restoration and the clinical durability of the supporting tissues. Today, post-core systems are widely used in highly coronally damaged teeth. Starting to use materials that are attached to dental tissue as adhesives made it possible to increase the resistance of the remaining tooth tissues. In the teeth whose root canal wall is thinned, it is possible to strengthen the teeth structurally and dimensionally against breaking by supporting the channels with a suitable material. With the use of composite resins, the restoration of large canals with thin walls has become possible. By the use of light-permeable plastic posts, it is possible to strengthen the thin-walled teeth by polymerizing the composite material in the root.

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Introduction

Deep caries, dental trauma, physician error and accidents developed during dental treatment or wide channels in the apex of the unresolved teeth, studies to create restorative problems for dentists have been going on for a long time. In order to restore the aesthetic and function of coronal damaged teeth due to caries, trauma and various reasons, it is necessary to apply prosthetic treatment following endodontic dental treatment. [1,2]

Use of traditional taper and casting shafts causes excessive pressure on weakened coronal structure against xiphoid strengths. Starting to use materials providing adhesion to dentine enables the reconstruction and rehabilitation of the lost dentin tissue. It has been observed that the resistance of fractures of the wide groove teeth reinforced with composite resins is increased. [3]

Frequent occurance of fractures of dental hard tissues after endodontic treatment has led to the illusion that the canal treated teeth are more fragile than the live teeth. [3,4] Although it is known that the moisture content of dentin is decreased in canal treated teeth compared to live teeth [5], this loss does not affect the hardness of dentin. [6] Trabert et al. [7] found that the weakening of the canal-treated teeth was due to loss of resistance because of deterioration in structural continuity rather than moisture loss. It is now accepted that a properly restored canal-treated tooth does not show a significant difference in resistance to chewing strengths compared to live teeth.

The resistance of endodontic treatment of the teeth to fracture is directly proportional to the amount of the remaining dentin structure. [39] Tjan [40] explained that 1 mm thick buccal dentin walled canals are more prone to fracture than 2mm and 3mm thick walled canal. In the researches which applied casting shaft and core in wide channel teeth, it was found that the loss of substance during the preparation of the teeth weakened the strength of the tooth against occlusal forces. [41] Such restorations result in root fractures and loss of teeth. [12]

The most common type of problem associated with shaft and core restorations is loss of retention and often appears to be a type of failure that can be compensated for by restoration renewal. [9] Assif and Gorfil [10] examined the biomechanics of the restorations of endodontically treated teeth and stated that shafts play a more important role in ensuring retention of the nucleus rather than maintaining the remaining tooth structure.

The ferrule effect protects the gingival dentin by acting as coping. This effect is also important for preventing movement of the post and marginal opening. It also prevents the rotation of the post and core during functional movements. Therefore, it constitutes the most important part of post core restoration. The more the remaining gingival dentin is covered, the better the occlusal loads are distributed[30] The aim of this study is to evaluate the root fracture resistance of anterior group teeth with thin root walls using different post materials and restorative materials.

Material Method

In this study, ethical rules were followed. In our study, 60 mesio-distal upper central incisors with a width of 7 mm were used. Teeth were divided into six groups: study group and two control groups. As the selection criteria, teeth without caries, without root canal treatment, no restoration, no crown damage to the enamel cement border, and no internal root resorption were selected.

Periodontal tissue residues on the teeth were cleaned with ultrasonic scaler and the teeth were kept in 0.1% thymol solution (+ 4 ° C) for 1 week and the teeth extracted from this solution were stored in 9% saline.

The crowns of the teeth are cut with a diamond disc (Northbel 936/012, Italy) 1.5 mm above the enamel-cement boundary perpendicular to the long axis and the surfaces are smoothed under irrigation with the aid of aerator drills.

The roots of the teeth were enlarged by applying step-back technique with 70 (K-Files 45-80) canal file. After the expansion, the canals were irrigated using 2 ml 2.5% NaOCl, 2 ml 5% EDTA and 2 ml distilled water. The canals were dried with paper cones (Densply USA) and then filled with gutta-percha (DiaDent® Gutta Percha Points, Seoul, South Korea) using the lateral condensation technique.

After filling process, the samples of the study groups were expanded with the help of 5.5 mm diameter (Mega-Gen Korea) drill under irrigation with the help of handpiece (NSK Japan. The remaining root canal wall thickness was determined as 1.5 mm.

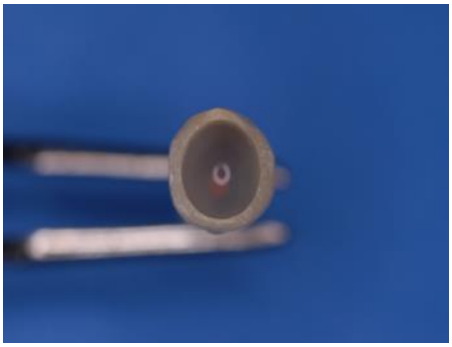


Figure 1

To ensure standardization, the canals of the teeth of the study group were enlarged, and X-ray films (RVG) were taken in bucco lingual direction and the root wall thicknesses were measured and the non-standard ones were excluded from the study group. (Figure 2)

Figure 2

Samples of the control group were expanded under irrigation with a 1.35 mm diameter reamer (Dentatus, USA). In this group, the root wall thickness was determined as approximately 3 mm.

(Figure 3)

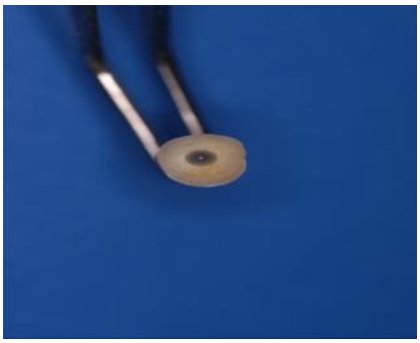


Figure 3

Root canals of the samples belonging to all groups were washed with 9% physiological saline during preparation. All teeth were then disinfected in 0.1% thymol solution (+ 4 ° C) and stored in 9% physiological saline until the experimental stage.

40 of 60 samples were used in the study group and 20 of them were used in the control group. Samples with a root canal wall thickness of 1 mm were randomly divided into 10 groups.These groups consist of the samples of 1.Group; Luminex - fiber (LF), 2. Group; Luminex – metal (LM), 3. Group; Panavia – Fiber (PF) and 4. Group; Panavia – Metal (PM).

After the root canal walls of the samples belonging to Group 1 (LF) are dried with Dia dent absorbent paper point,a self-etch adhesive (Ivoclar, Vivadent AG, Schaan / Liechtenstein) was applied in two layers. After the excess adhesive (Ivoclar, Vivadent AG, Schaan / Liechtenstein) has been removed with Dia dent absorbent paper point, plastic post(Dentatus luminex smooth plastic post) which transmits light was placed into the root canals(Figure 4) and the adhesive was polymerized with light (Woodpaker, FlashSoft Led beam device 1200 W / cm 2) for 20 sec.

Examples, after the root surface application, a fluid composite (Ivoclar tetric evoflow Vivadent AG, Schaan / Liechtenstein) was filled into the root canal with the aid of lentilo. A light-transmitting post (Ø 1.3 mm, Dentatus luminex smooth plastic post) from the Luminex system was placed in a central position within the root canal and the composite material (Ivoclar tetric evoflow Vivadent AG, Schaan / Liechtenstein) was polymerized with light (FlashSoft Led beam device 1200W / cm2Woodpecker) for 20s. After polymerization, the plastic posts were removed and the cavities were cemented with self-

adhesive resin cement (SmartCEM2 Densply USA) with fiber posts (Ø 1.3 mm, Dentatus Lusence fiber USA) that were compatible with the channel diameter.

The root canal surface treatment of the samples of Group 2 (LM) (Figure 3.23,3.234), composite (Ivoclar tetric evoflow Vivadent AG, Schaan / Liechtenstein) application and preparation of space for the canal shaft were performed as in Group 1. The metal shaft (Dentatus Surtex titanium, Ø 1.3 mm) (Figure 3.22), which is compatible with the root canal width of the luminex system, was then bonded with self-adhesive resin cement (SmartCEM2 Densply USA).

In the examples of Group 3 (PF), An adhesive resin cement paste A&B (Panavia Kuraray Japan) was filled into the canal with the help of lentilo without any surface treatment on the root canal walls. A 1.30 mm diameter fiber shaft (Luminex, Dentatus lusence fiber) was then fixed in the central position within the root canal. To provide adhesive resin cement polymerization, an oxygen inhibiting material (Oxyguard II Kuraray) was applied to the cement surface. In addition, light (Woodpecker) (FlashSoft Led beam device 1200 W / cm2) was applied for 20s.

In the examples of Group 4 (PM), An adhesive resin cement paste A&B (Panavia Kuraray Japan) was filled into the canal with the help of lentilo without any surface treatment on the root canal walls.A metal shaft (Dentatus Surtec titanium) with a diameter of 1.30 mm was then fixed in the central position in the root canal.To provide adhesive resin cement polymerization, an oxygen inhibiting material (Oxyguard II Kuraray) was applied to the cement surface.Twenty samples of the control group with 3 mm root canal wall thickness were randomly divided into 2 groups of 10 (Group 5 and 6). In Group 5; 1.30 mm diameter fiber shafts (Dentatus lusence fiber) were inserted into the root canal using lentilo using self-adhesive cement (SmartCEM2 Densply USA) and light (Woodpecker) (FlashSoft Led beam device 1200 W / cm 2) was applied for 20 seconds.In group 6, metal shafts of 1.30 mm diameter (Dentatus Surtec titanium) were applied to the canal with self-adhesive cement (SmartCEM2 Densply USA).

Self-etch binding agent (Adhese one viva pen, Ivoclar, Vivadent AG, Schaan / Liechtenstein) was applied directly to the surface of the teeth of the teeth in each of the six groups prepared and left on the surface to which it is applied, not less than 30 s;

Bonding excess was removed with high pressure air and the binding agent (Woodpecker) (FlashSoft Led beam device 1200 W / cm2) was polymerized with 10 s light.Polycarbonate temporary crowns (Swedish

Dental) were used to shape the crown of the tooth in the form of a cut tooth and to standardize the core.The crowns were filled with composite material (Ivoclar MultiCore Flow) and polymerized with 40s light (Woodpecker) (Flash Soft Led beam device 1200 W / cm2)After the polycarbonate crown was removed, the excess was removed and ferrul preparation was performed on the prepared samplesFor the preparation of metal crowns of the samples belonging to each group, the measurement of the coronal part of the samples (Panasil Putty Fast, Kettenbach) was taken and false roots were obtained from Type IV hard plaster. Each of the false roots was assigned a number so that the groups and specimens did not interfere..

After the die spacer (cement cavity leaving material) (Durolan) (Germany) was applied on the false roots (except for a portion of about 1 mm in the root area), it was immersed in melted wax (Mega-Dip Flexi, Germany) in a preheated chamber and wax copings were obtained.

Copings poured from Ni-Cr alloy (Wiron 99; Bego, Bremen, Germany).After the casting process was carried out in an induction type furnace (Gmg Infra Therm-2AT), metal surpluses were removed and placed on each crown, the prepared crowns were checked on the samples (Figure 3.41) and cemented with glass ionomer cement (Voco-meron).

All sample surfaces (Digital 3-Well Wax Pot) were immersed in 92^0 degree melted wax container to obtain 0.2-0.3 periodontal ligament thickness. All samples were then embedded in autopolymerizing acrylic resin using molds made of triangular metal, 2mm below the enamel cementation line (Heraus Kulzer Germany). After the polymerization of the acrylic, the waxes on the root surface were cleaned. In order to mimic periodic ligaments, polyvinyl siloxane measuring material (Bisico S4 Germany) was injected into the remaining cavity and the samples were placed again.

1 mm / min force was applied to the notch region prepared in the cingulum of the crowns which were cemented on the samples with the vertical arm of the universal tester (Shimadzu, Japan).The fracture values obtained were recorded in N (Newton),

Statistical analysis was performed using SPSS (SPSS for Windows 15.0, Chicago IL, USA).Firstly, the standard deviations of the groups that were used fiber post and metal post were examined, then one-way analysis of variance (ONE WAY ANOVA) and two-way analysis of variance (TOO WAY ANOVA)

were used to determine the difference causing (POST-HOC TUKEY HDS) test.Significance was evaluated at p <0.05.

Results

The arithmetic means of the fiber post groups were firstly obtained and then their standard deviations were found.When we examine the tables and graphs, one of the groups is different from the others.The smallest standard deviation in the table is seen in the panavia fiber group (PF) and then in the Luminex fiber group (LF).The differences in the samples in these two groups are small and the fracture values are close to each other, ie a homogeneous structure is observed.In the control group, fiber diffraction values with large standard deviations are far from each other.The variation in the samples in this group is high, ie there is a heterogeneous structure.

When we look at the fracture resistance of the teeth, the highest resistance was observed in the control groups, the lowest resistance was seen in Group PF and PM.However, Group LF and LM break resistance is higher than Group PF PM.

ONE WAY ANOVA test was applied to these three groups in order to find meaningful relationship between fiber post treated groups. The Anova test can be found alone or by cumulative comparison of the arithmetic means of three or more groups.In this comparison, if at least one group was found to be significant, Anova would be significant.

In the test performed, X group was found to be significantly different in the analysis of variance between the groups and within the groups dF=59,964 ; S.d=2;27 p<0,001. This was due to the fact that the group KF was more resistant and also the difference between the study groups LF and PF groups.

In the applied test, p <, 001 results were significant. Multiple comparison test (POST-HOC TUKEY HSD) was applied to determine where the significant difference between the groups originated. In the fiber post groups, the control group was significantly more resistant than the study groups.

Standard deviations of the arithmetic mean of the metal post groups (Group PM and KM) were found.The highest fracture resistance average KM (1195,671) standard deviation (200,327), the lowest fracture resistance average Group PM (350,957) standard deviation (50,092). (ONE WAY ANOVA) test was

used to find a significant relationship between the groups containing metal post. P <, 001 results were found to be significant.

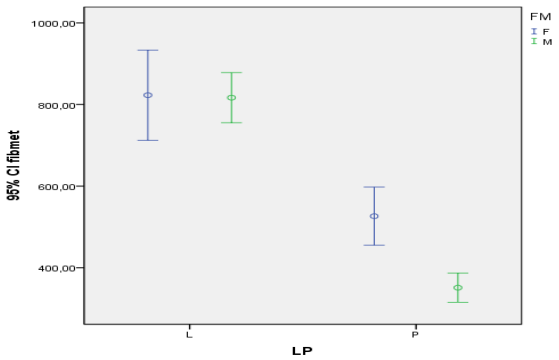
In the test performed, X group was found to be significantly different between the groups and in the variance analysis calculations within the groups (dF=107,330 ; S.d=2;27); The results of the test were p <0.001, meaningful (p <0.001). Multiple comparison (POST-HOC TUKEY HSD) test was used to determine where the significant difference between the groups originated.In the metal shaft groups, the control group was significantly more resistant than the study groups.The LM group was significantly more resistant than the PM group.

As a result of the two-way analysis of variance (Two WAY ANOVA) the following results were obtained:

- There is a significant difference between the materials used (Lumineks + composite resin and Panavia). (P <0.00).
- The interaction between the shaft and material used (Fiber, Metal and Luminex, Panavia) is significant. (F = 6.539, S.d. = 1; 36, p = 0.015).
- • There is a significant difference between the shaft used (Fiber post: 674,38). (F=7,52, S.d.=1;36, p=0,009).
- • The difference between Luminex Fiber Post and Metal Post (819,86) and Panavia Fiber Post and Metal Post (438,59) was found to be statistically significant. (F = 132.91 S.d = 1; 36, p <0.05) (Table 1, Graph 1).

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	1607398,978	3	535799,659	48,990	,000
Intercept	15836947,665	1	15836947,665	1448,023	,000
LP	1453604,458	1	1453604,458	132,908	,000
FM	82282,043	1	82282,043	7,523	,009
LP * FM	71512,477	1	71512,477	6,539	,015
Error	393730,121	36	10936,948		
Total	17838076,764	40			
Corrected Total	2001129,099	39			

Table 1 Two way variance (TOU WAY ANOVA) test of LP, FM fracture changes,



Graph 1,LP, FM Interactions graph,

There is no significant difference between Luminex Fiber (822,9277) and Metal (816,7833).There is a significant difference between Panavia Fiber (526,2311) and Metal (350,9566).Paired Samples Test (Paired Samples Test) was used to find the source of significant difference between the groups.In the (t) test analysis, t = 5,116 p <0.001, there is a significant difference between the groups.

The fractures were observed in the cervical in KF and KM control groups, in the study groups Group LF and LM were observed in the cervical part, Group PF and PM were observed in the apical direction.

In our study, taking these definitions into consideration, we classified root fractures after fracture experiments. In fiber post group (Control); 4 pieces can be repaired and 6 pieces can not be repaired, Metal post group (Check); 5 pieces are repaired and 5 pieces can not be repaired; 3 units are repairable 7 units can not be repaired; 5 are repairable and 5 can not be repaired; 2 pieces can be repaired and 8 pieces can not be repaired; There are 10 irreparable root fractures.

Discussion

Root fractures encountered in the clinic cause serious problems and cause the tooth to become unusable and withdrawal.[11,12] In our study, the fracture strength of the roots was examined and the results were evaluated in terms of repairable and non-repairable root fractures.

In the studies on the resistance of the teeth restored with shaft and core systems due to material loss, when the teeth are examined in terms of localization, it is seen that most of the researches are done on the anterior region teeth [13,14,15,16] Therefore, in our study, upper central teeth were used in accordance with the literature. As the size of the teeth is an important variable in fracture resistance [17], In our study, special efforts were made to select and distribute the teeth in equal sizes in groups close to each other. According to this information, all teeth were cut and enameled from the enamel-cement boundary and all root lengths were prepared as 15 mm. The mesiodistal dimensions and buccolingual

dimensions of the teeth were then measured and the teeth were divided into 10 groups so that there was no difference between the groups. Thus, the effect of the variables depending on the tooth sizes was tried to be eliminated as much as possible.

In our study, “fluid composite” and “dual cure adhesive resin cement” were applied with lentilo into the root canal to support dentin tissue,it is stated that this application prevents the air gap that may form inside the resin material and creates a more homogeneous film thickness and forms a more resistant structure. [18] Especially when working with dual-cure resin cement used in our study, it is necessary to pay attention to filling the channel with lentulo, considering that cement will harden in anaerobic environment[19,20,21]In addition to this disadvantage, the use of lentulo allows the full adaptation of cement to the channel walls by centrifugal effect and prevents the formation of air bubbles. [22] In the studies, It is stated that the polymerization depth and bond strength obtained with II. generation LED light source together with self-etching primers are higher than other light sources. [23,24] Therefore, to reduce the possibility of failure, in our study, self-etch primary and II. Generation LED light source is preferred

In addition, self etching / self priming adhesive systems have been observed to provide a good connection to dentin in the cervical, middle and apical triad of the root.In the studies using self-etching systems, no statistical difference was observed between the connection strengths in the cervical, middle and apical triple regions of the root. [23] However, the self-etching smear layer can often adversely affect adhesion.In adhesion processes where acidification is not applied, penetration into dentin tubules cannot be achieved sufficiently.

The coronal smear layer contains the dentin matrix composition, while the endodontic smear layer contains odontoblastic activity fragments, microorganisms and necrotic residues. It has been reported that the application of self-etch adhesives as a thick adhesive layer increases the bonding and the presence of a thick layer in total-etch systems reduces the bonding. [25,26]

In this study, finger pressure was applied for 1 minute in order to simulate the clinical environment in the bonding of shafts[27,28,29] in all groups, 2 mm ferrule was prepared at the level of the cole and samples were prepared and crushed. In order to increase the retention of the core and the resistance of the teeth in the endodontically treated teeth with severe substance loss, some clinicians have suggested that ferrule of different sizes in the cervical of the tooth should be used in post-core applications. [30.11]

Ferrule effect also prevents breakage due to lateral forces,Fracture can be seen in the root when ferrule is not formed [31] As stated in the studies on core materials, when plastic formers are used in core making, the core material is more homogeneous, thereby preventing the formation of air bubbles[32,33] In this study, in order to show the homogeneous structure of the core material, the core structure was formed by using the inner surface of the plastic polycarbonate temporary crowns.

When the effects of press and stress forces applied on shafts are examined, force applications are made on crown prosthesis applied on shaft and core system.[34,35,36,37] In this study, full metal crown prostheses were prepared in order to reflect the clinical conditions on the samples better.

In our study, it is thought that embedding of test specimens in a rigid material such as acrylic resin affects loading forces and failure values of the specimens.[17] Therefore, in order to atclit the elasticity of the periodontium, in all samples, polyvinyl siloxane-based II.measurement material was applied at equal thickness around the root surface.[13, 35] [13, 35] The periodontal ligament of polyvinyl siloxane mimics alveoli of acrylic resin, while blocks mimic bone socket. [13]Thus, rigid forces on the root surfaces are avoided.In addition, a 135-degree angle, which is the contact angle of the lower and upper front groups, is provided by a device created in our study to simulate the diogonal contact angle [38].

In our study, it is essential to support the root canal by using prefabricated metal shaft and adhesive resin materials in teeth with thin root dentin wall. For this purpose, “fluid composite” and resin adhesive resin cement ”were used.Fluid composites contain smaller particle size and less particle ratio than hybrid composites.As the organic matrix ratio increases, a low viscosity composite is obtained.Yoldaş et al. [42] reported that reinforcing with composite resin in endodontically treated highly destructive teeth reduces stresses in the cervical part, thereby reducing the risk of root fractures.The composite material absorbs the forces due to its elastic modulus and gives good results especially in periodic loading tests.

[43,44]Carvalho CAT et al. [47], in a study, strengthened dentin thickness with composite resin showed that the fracture resistance of fine roots was greatly increased. Katebzadeh [48] observed that this technique greatly strengthens teeth against breakage when comparing resin strengthening techniques to all negative control groups. El-Khodery [49] confirmed that composite resin and spindle-bonded

dentin and core crowned teeth had higher resistance to pressure at 45 degrees, with 59% extra resistance compared to the group without root reinforcement.

In our study, cervical fractures were caused by failure of the control group while apical root fractures were caused by failure of the study group.These results are in line with the results of Lyons [50].A similar study suggests that the strength of a tooth is directly related to the amount of dentin tissue around the post.[51]

Dual-polymerized cements are both light and chemically curing cement.The biggest advantage of the system is the control of hardening and working times.In such cements, the reaction begins with irradiation.It reaches its maximum power after 24 hours.[52] Resin cements have been reported to be mechanically deformed by lateral masticatory forces to the teeth. [53] However, after intraradicular restoration of large canal teeth with composite resins, they are not affected by such mechanical deformations due to the modulus of elasticity of the composite close to dentin [54].In our study, groups reinforced with composite resin showed more resistance to fracture and root fracture resistance than adhesive resin cements.

Balkaya M.C. and Birdal S. [55] observed similar results in a study using fiber posts of different diameters. These researchers, in their work, have reported that reinforcement with composite resin has significantly greater fracture strength than adhesive resin cement. [55]

In our study, the polymerization of the composite resin is achieved by special channel shafts that transmit the initiating light through the root canal walls to the apical.This ensures that the polymerization is fully assured throughout the entire composite mass. This may be one of the reasons why the bond strength is obtained at the desired level in the composite material. [56]

O.Yoldaş,T.Akkova, in a study investigating the bonding resistance of resin materials to root canal walls, found that composite resins have a higher bond strength than adhesive resin cements.[42] Considering the results of this study and the results of our study, it can be said that a strong connection with dental tissues is a very important factor in strengthening dental tissues.

Vaidya Vidya N, Chitnis Deepa P, in a study in which control group was chosen as casting shaft, no significant difference was observed between prefabricated metal and fiber shafts in reinforcing with composite resin in roots with thinned dentin walls. As a result, it was determined that composite resin

provides reinforcement in thin root canals.In our study, similar to the results of this study, no significant difference was observed between prefabricated fiber and metal shaft in terms of resistance in composite resin-reinforced roots.However, there was a significant difference in root resistance between prefabricated fiber and metal shafts in the groups that we reinforced with adhesive resin cement.

Borelli et al. [61] divided the root fracture etiology into two.The first is occlusal traumas and the second is endodontically treated teeth fractures.The most common of these are fractures in endodontically treated teeth.Andreasen et al. [62] classified root fractures as horizontal fractures (horizantal: multiple fractures (oblique), cervical fractures, (apical midline, and apical fractures) and vertical fractures (vertical).

Andreasen , Sousa et al. Stated that while describing horizontal fractures, they usually occur with rupture and that they affect the dentin and cementum of the tooth. [63,64] Andreasen et al. Reported that horizontal fractures usually occur more often in the maxillary incisors. [65] Caliskan and Pehlivan in their study on maxillary incisors found fractures in 4 of the apical and cervical fractures.[66] In our study, cervical and apical fractures were also found. Cvek et al. reported that cervical and chronal fractures are easier to repair, but apical 1/3 and apical fractures are difficult to repair [69,70]

According to Andreasen et al., The diagnosis of apical fractures was difficult because the chronal segment was not separated. [67] Balkaya M. C. and Birdal S. in their root strengthening work,cervical and apical fractures similar to our study were found in the fracture experiments of the groups they used. [55] In one of the study groups, Khalid .H et al applied composite resin reinforcement on roots with thin root walls. In the fracture test, similar to our study, repairable cervical fractures were found in the groups reinforced with composite resins. [68]

Result

In our study, supporting the root canal walls with composite resin significantly increased fracture resistance,

The fact that the shafts used in the reinforcement process with composite resin being fiber or metal did not create a significant difference in fracture resistance,

Reinforcing with composite resin resulted in significantly greater fracture resistance increase than supporting root canal walls using adhesive resin.

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